Proceedings of the United States Livestock Sanitary Association

Fifty-Fourth Annual Meeting
Proceedings

FIFTY-FOURTH ANNUAL MEETING of the UNITED STATES LIVESTOCK SANITARY ASSOCIATION

HOTEL WESTWARD HO
Phoenix, Arizona
November 1, 2, 3, 1950
CONTENTS

Contents

History .......................................................... 1
Welcome to Arizona. Hon. Dan Garvey, Governor ............. 9
Response to Address of Welcome. R. W. Smith .................. 11
Address of President. C. P. Bishop ............................... 13
Report of the Secretary. R. A. Hendershott ..................... 21
Report of the Auditing Committee. H. Geyer .................... 27
Memorial Service. Hugh E. Curry .................................. 28
Presentation of Keys to Past Presidents. R. A. Hendershott ...... 30
Progress in the Eradication of Foot and Mouth Disease in Mexico. Gen. H. H. Johnson ....................... 41
Report of the Committee on Foot and Mouth Disease. H. F. Wilkins .... 44
Problems of the Livestock Industry Created by Atomic Explosion. Wright H. Langham .......................... 48
Discussion .......................................................... 59
Report of the Six State Experiment with Brucella "M" Vaccine. T. C. Green .............. 72
Report of the Brucellosis Eradication Project. Asa Winters ....... 78
Remarks on Brucellosis in Denmark. H. C. Bendixen ............. 81
What is Known About Immunity to Brucellosis. Karl F. Meyer .... 87
Report of the Committee on Brucellosis. Ralph L. West ........... 98
Experience in Pennsylvania in Tracing the Origin of Cattle Reported on Regular Kill to be Tuberculous. H. A. Milo .............. 103
Progress in Control of Bovine Tuberculosis in Canada. K. F. Wells ................ 107
Studies of Tuberculin, Comparison of Various Types of Tuberculin Tests on Reactor Cattle. B. C. Swindle, L. A. Baisden, Howard W. Johnson, R. R. Henley .. 110
Bovine, Avian and Swine Tuberculosis Eradication. A. K. Kuttler ........... 122
Report of the Committee on Tuberculosis. I. G. Howe ............. 126
Recent Literature on Newcastle Disease. F. R. Beaudette ........... 132
Intranasal Vaccine, Its Role in a Newcastle Disease Control Program. S. B. Hitchner, G. Reising and H. Van Roekel .................. 154
Observations on the Relationship of Passive Immunity to Response Following Intranasal Vaccination Against Newcastle Disease. Floyd S. Markham, C. A. Bottoroff and L. B. Tennison .............. 161
Infectious Sinusitis of Turkeys. L. C. Grumbles, W. A. Boney, Jr ......... 166
A Respiratory Disease (Bronchitis) of Quail Caused by a Virus. Norman O. Olsen .............................. 171
Report of the Committee on Transmissible Diseases of Poultry. John Delaplaine ........... 183
The Poultry Grading and Inspection Program of the United States Department of Agriculture. W. D. Termohlen .......................... 188
Objections of Public Health Authorities to the Poultry and Grading Program of the United States Department of Agriculture. O. Sussman .......................................................... 197
Discussion of Papers on the United States Department of Agriculture Program of Poultry Grading and Inspection................................................................. 204
Report of the Committee on Meat and Milk Hygiene. C. S. Bryan .................. 208
The Rabies Control Program of the World Health Organization. Harald N. Johnson .......................................................... 210
Report of the Committee on Rabies. A. L. Brueckner .................................. 216
Morbidity and Mortality Data in Great Britain. A. W. Stableforth .................... 219
Report of Committee on Morbidity and Mortality. C. R. Schroeder ................... 226
Report of the Committee on Anaplasmosis. L. T. Giltner .................................. 234
Report of the Committee on Community Auction Sales. H. G. Geyer ................... 236
Effect of Parasites on Swine Production. Lloyd A. Spindler ............................ 241
Eradication of Sheep Scabies. H. E. Kemper and I. H. Roberts ....................... 247
Report of the Committee on Parasitic Diseases. Benjamin Schwartz .................. 254
Laboratory Studies on the Immunizing Value of Hemorrhagic Septicemia Bacterin and Blackleg Bacterin. I. S. Danielson and R. Bolton ............................ 259
Report of the Committee on Biologics and Pharmaceuticals. S. F. Scheidy .............. 272
Rhinitis of Swine. L. P. Doyle ............................................................ 276
Ictero-Anemia of Swine. Earl J. Splitter .................................................. 279
Report of the Committee on Transmissible Diseases of Swine. L. M. Hutchings .......... 287
Report of Committee on Laws and Regulations. H. U. Garrett ....................... 290
Report of the Committee on Public Relations. R. W. Smith ............................ 297
Report of the Representatives to the Meeting of National Association of Commissioners, Secretaries and Directors of Agriculture. R. A. Hendershott ................. 298
Report of the Committee on Legislation. T. C. Green .................................. 301
Report of the Committee on Resolutions. F. E. Mollin .................................. 302
Report of the Committee on Policy. T. O. Brandenburg .................................. 306
Proposed Amendment of the Constitution and Bylaws ..................................... 307
Nomination and Election of Officers ......................................................... 328
Constitution and By-Laws ................................................................. 330
Proceedings of the First Meeting Interstate Association of Live Stock Sanitary Boards, September 27–28, 1897 ............................................................... 337
List of Members by States ................................................................. 361
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R. A. Hendershott, Trenton, New Jersey  M. N. Riemenschneider, Denver, Colorado
J. V. Knapp, Tallahassee, Florida  A. P. Schneider, Boise, Idaho

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R. A. Hendershott, Trenton, New Jersey
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H. G. Geyer, Columbus, Ohio
J. G. Hardenbergh, Chicago, Illinois
C. C. Hastings, Williamsville, Illinois
R. A. Hendershott, Trenton, New Jersey
C. E. Hughes, Des Moines, Iowa

F. J. Keilholz, Philadelphia, Pennsylvania
Herman Aaberg, Chicago, Illinois
B. M. Lyon, Pearl River, New York
S. H. McNutt, Madison, Wisconsin
H. W. Schoening, Washington, D. C.
E. R. Shannon, Lafayette, Indiana
A. H. Quin, Kansas City, Missouri
B. T. Simms, Washington, D. C.
F. C. Smith, Groveport, Ohio
<table>
<thead>
<tr>
<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
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<tbody>
<tr>
<td>Sept. 27-28, 1897‡</td>
<td>Fort Worth, Texas</td>
<td>*Mr. C. P. Johnson, Springfield, Ill.</td>
<td>*Mr. D. O. Lively, Fort Worth, Texas</td>
</tr>
<tr>
<td>Oct. 11-12, 1898</td>
<td>Omaha, Nebraska</td>
<td>*Mr. C. P. Johnson, Springfield, Ill.</td>
<td>*Mr. Taylor Riddle, Kansas</td>
</tr>
<tr>
<td>Oct. 8-9, 1901</td>
<td>Buffalo, New York</td>
<td>*Dr. E. P. Niles, Virginia</td>
<td>*Dr. F. T. Eisenman, Louisville, Ky.</td>
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<tr>
<td>Sept. 23-24, 1902</td>
<td>Wichita, Kansas</td>
<td>*Mr. W. H. Dunn, Tennessee</td>
<td>*Dr. Wm. P. Smith, Monticello, Illinois</td>
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<tr>
<td>Aug. 23-24, 1904</td>
<td>St. Louis, Mo.</td>
<td>Dr. J. C. Norton, Arizona</td>
<td>*Dr. Wm. P. Smith, Monticello, Illinois</td>
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<tr>
<td>Sept. 16-17, 1907</td>
<td>Richmond, Va.</td>
<td>Dr. D. F. Luckey, Columbia, Mo.</td>
<td>*Dr. S. H. Ward, St. Paul, Minn.</td>
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<tr>
<td>Dec. 5-6-7, 1910</td>
<td>Chicago, Ill.</td>
<td>Dr. C. E. Cotton, St. Paul, Minn.</td>
<td>*Dr. J. J. Ferguson, Chicago, Ill.</td>
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<td>Dec. 5-6, 1911</td>
<td>Chicago, Ill.</td>
<td>*Dr. John F. Devine, Goshen, N. Y.</td>
<td>*Dr. J. J. Ferguson, Chicago, Ill.</td>
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<tr>
<td>Dec. 2-3-4, 1913</td>
<td>Chicago, Ill.</td>
<td>Dr. Peter F. Bahnse, Atlanta, Ga.</td>
<td>*Dr. J. J. Ferguson, Chicago, Ill.</td>
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<tr>
<td>Dec. 3-4-5, 1917</td>
<td>Chicago, Ill.</td>
<td>*Dr. J. G. Wills, Albany, N. Y.</td>
<td>*Dr. S. H. Ward, St. Paul, Minn.</td>
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<td>Dec. 2-3-4, 1918</td>
<td>Chicago, Ill.</td>
<td>*Dr. M. Jacob, Knoxville, Tenn.</td>
<td>*Dr. S. H. Ward, St. Paul, Minn.</td>
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<td>Date</td>
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<td>Authors</td>
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<tr>
<td>Nov. 29-30, Dec. 1, 1920</td>
<td>Chicago, Ill.</td>
<td>Dr. S. F. Musselman, Frankfort, Ky.</td>
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<tr>
<td>Nov. 28-29-30, 1921</td>
<td>Chicago, Ill.</td>
<td>Dr. W. F. Crewe, Bismarck, N. Dak.</td>
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<tr>
<td>Dec. 6-7-8, 1922</td>
<td>Chicago, Ill.</td>
<td>Dr. T. E. Munce, Harrisburg, Pa.</td>
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<tr>
<td>Dec. 5-6-7, 1923</td>
<td>Chicago, Ill.</td>
<td>Dr. W. J. Butler, Helena, Montana Va.</td>
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<td>Dec. 3-4-5, 1924</td>
<td>Chicago, Ill.</td>
<td>Dr. J. G. Fennelghough, Richmond, Va.</td>
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<tr>
<td>Dec. 2-3-4, 1925</td>
<td>Chicago, Ill.</td>
<td>Dr. J. H. McNeil, Trenton, N. J.</td>
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<tr>
<td>Dec. 6-7-8, 1926</td>
<td>Chicago, Ill.</td>
<td>Dr. John R. Mohler, Washington, D. C.</td>
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<tr>
<td>Nov. 30-Dec. 1-2, 1927</td>
<td>Chicago, Ill.</td>
<td>Dr. L. Van Es, Lincoln, Nebraska</td>
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<td>Dec. 5-6-7, 1928</td>
<td>Chicago, Ill.</td>
<td>Dr. C. A. Cary, Auburn, Alabama</td>
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<td>Dec. 4-5-6, 1929</td>
<td>Chicago, Ill.</td>
<td>Dr. Chas. G. Lamb, Denver, Colo.</td>
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<td>Dec. 3-4-5, 1930</td>
<td>Chicago, Ill.</td>
<td>Dr. A. E. Wight, Washington, D. C.</td>
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<td>Dec. 2-3-4, 1931</td>
<td>Chicago, Ill.</td>
<td>Dr. J. W. Conaway, Columbia, Mo.</td>
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<tr>
<td>Nov. 30-Dec. 1-2, 1932</td>
<td>Chicago, Ill.</td>
<td>Dr. Peter Malcolm, Des Moines, Iowa</td>
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<td>Dec. 6-7-8, 1933</td>
<td>Chicago, Ill.</td>
<td>Dr. L. Van Es, Lincoln, Nebraska</td>
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<td>Dec. 5-6-7, 1934</td>
<td>Chicago, Ill.</td>
<td>Dr. T. E. Fauth, Albany, N. Y.</td>
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<td>Dec. 4-5-6, 1935</td>
<td>Chicago, Ill.</td>
<td>Dr. T. E. Robinson, Providence, R. I.</td>
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<td>Dec. 2-3-4, 1936</td>
<td>Chicago, Ill.</td>
<td>Dr. E. H. Waddell, Reno, Nevada</td>
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<tr>
<td>Nov. 30-Dec. 1-2, 1938</td>
<td>Chicago, Ill.</td>
<td>Dr. R. W. Smith, Concord, N. H.</td>
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<tr>
<td>Dec. 6-7-8, 1939</td>
<td>Chicago, Ill.</td>
<td>Dr. D. E. Westmorland, Frankfort, Ky.</td>
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<tr>
<td>Dec. 4-5-6, 1940</td>
<td>Chicago, Ill.</td>
<td>Dr. J. L. Axby, Indianapolis, Ind.</td>
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<tr>
<td>Dec. 3-4-5, 1941</td>
<td>Chicago, Ill.</td>
<td>Dr. H. D. Port, Cheyenne, Wyoming</td>
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<tr>
<td>Dec. 2-3-4, 1942</td>
<td>Chicago, Ill.</td>
<td>Dr. E. A. Crossman, Boston, Mass.</td>
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<td>Dr. I. S. McAdory, Auburn, Alabama</td>
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### Historical (Continued)

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<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
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<tr>
<td>47. Dec. 1–2–3, 1943</td>
<td>Chicago, Ill.</td>
<td>Dr. W. H. Hendricks, Salt Lake City, Utah</td>
<td>Dr. R. A. Hendershott, Trenton, N. J.</td>
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<tr>
<td>49 Dec. 5–6–7, 1945</td>
<td>Chicago, Ill.</td>
<td>Dr. C. U. Duckworth, Sacramento, Calif.</td>
<td>Dr. R. A. Hendershott, Trenton, N. J.</td>
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<tr>
<td>53. Oct. 12–13–14, 1949</td>
<td>Columbus, Ohio</td>
<td>Dr. T. O. Brandenburg, Bismarck, N. D.</td>
<td>Dr. R. A. Hendershott, Trenton, N. J.</td>
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</tbody>
</table>

* Deceased.
† This was the last meeting of the Interstate Association of Live Stock Sanitary Boards.
‡ Reprinted in 54th Annual Report.
In an endeavor to piece together some historical information pertaining to the Association, one should give consideration to and review some of the history of Texas fever, as this disease and the regulations that were employed because of it, led to the meeting of state authorities to discuss what action they should take to protect the livestock of their respective states and evolved into an Association, now known as the United States Livestock Sanitary Association.

Because of the restrictive regulations imposed upon cattle which were ready for movement from southern states to northern grass or feeding areas, the operators of the Fort Worth Stock Yards invited the state veterinarians of the northern states to come to Fort Worth, Texas, on September 27-28, 1897, to observe a new method reputed to free the cattle from disease-bearing ticks. So the history of the Association is definitely tied to Texas fever or southern cattle fever and an understanding can only be had by reviewing the history of “tick fever” in this country.

TEXAS FEVER

This disease is one of the oldest in recorded history, having been reported in France, Italy, Turkey, West Indies, Mexico, Central America, South America, Australia, Africa, Ireland, Finland, Southern Russia, China, Java, Borneo, Philippine Islands and Rumania. It appears that Texas fever entered the United States through importations of cattle from the Spanish Colonies of the West Indies Islands and Mexico. Although cattle are known to have been imported from these sources as early as 1610, it is not known just when the disease first appeared in the livestock of the Colonies.¹

The first reports of the occurrence of Texas fever did not come from that portion of the southern area of the United States where the disease was supposed to be common but from areas to the north where the disease had been carried by the movement of cattle from the south.

One of the earliest reports of this disease occurs in a lecture by Dr. James Mease on November 3, 1814, before the Philadelphia Society for Promoting Agriculture. Dr. Mease called attention to the fact that cattle being driven northward from a district in South Carolina left a trail of fever in all herds with which they came into contact on their progress to the north. This reference was with regard to a herd of cattle that was driven in 1796 from South Carolina to Pennsylvania, where the disease broke out in Lancaster County and other places. Dr. Mease had done some research on this herd and stated that the people of Virginia prohibited the passage of North Carolina cattle through that state; that these cattle infected others while they themselves remained healthy and that cattle from Europe or the interior when taken to the seacoast section of our country south of Virginia, were attacked by the disease and it generally proved fatal. Again in a report to the Society in September, 1825, Dr. Mease stated, “The circumstances of cattle from a certain district in South Carolina affecting others with this disease has long been known.” The precise locality or its extent was not given.

¹
Mr. J. Willerson, Athens, Georgia, in April, 1867 reported to the Department of Agriculture that cattle seldom contract the disease unless removed from where they were raised; that if they were taken from the mountain country to the low country, they soon contracted the fever and died without transmitting the disease to the native cattle; that cattle taken from the low country up into the mountains continued to improve, while they communicated the infection to animals with which they came in contact, but after remaining in the colder country for a time they lost the power of communicating the infection.

Little was known of Texas fever in the northern states prior to 1866, although as early as 1795 the Legislature of North Carolina passed the following law:

"No person shall hereafter drive any cattle from those parts of this state where the soil is sandy and the natural production or growth of timber is the long-leaf pine, into or through any of the highland parts of the state where the soil or growth of timber is of a different kind, between the first day of April and the first day of November in every year, under the penalty of four dollars for each and every head of cattle so driven, to be recovered and applied as before mentioned."

In 1814, the State of Virginia refused to allow the passage of cattle through the State from certain sections of South Carolina.

North Carolina, in 1836, passed a law prohibiting the driving of cattle into the State from either South Carolina or Georgia between April 1 and November 1. Despite these laws, the next forty-two years witnessed the spread of this disease to the Blue Ridge Mountains. Mr. Lenoir, in a letter published in 1879 likened the progress of the disease to the spread of ringworm, slowly advancing with an angry external border and apparently dying away in the district over which it had passed.

During these years the settlers moving westward, established herds, the livestock industry developed and the method of driving stock overland gradually spread the disease over the entire South and frequently to sections in the North. By 1877 it was the cause of much alarm throughout the country, especially along transportation and trail routes. Invariably, where cattle from Texas or other southern states were driven to northern markets, they left disease and death in their wake.

By far the greatest losses seem to occur by driving Texas cattle through Missouri, Kansas, Arkansas and Indian Territory for distribution as feeders to the various western states.

In 1852, the "Murrain" was reported as highly destructive in Missouri and from 1858 to 1861 it had increased to such an extent along the Texas cattle trails that Missouri in 1861 passed laws to regulate the movement of herds from the south. Other states soon followed the example set by Missouri. The people in these states were aroused to great indignation because some Texas cattlemen persisted in driving their herds north and armed parties confronted and turned back the invading herds. This action proved effective in preventing further losses.

The Texas Almanac, 1949-1950, on page 259 records the fact that Baxter Springs, Missouri lost a great chance as a trail terminal when Missouri farmers in 1866 established a "shotgun quarantine" against the passage of trail herds from Texas.

James Daugherty, later of Abilene, Texas was flogged by a mob of Missouri farmers on a drive in 1866 to Baxter Springs, Missouri.

The disease ceased in all of these border states during the Civil War, but imme-
Immediately after the close of the war, when the Texans again sought an outlet through Kansas and Missouri for their accumulated surplus stock, it reappeared.

In order to avoid the hostile opposition met in the adjacent states, Texas cattle-men were forced to resort to shipping their livestock up the Mississippi River by boat. By 1867, Cairo, Illinois, became the chief point of trans-shipment of cattle from steamboat to railroads. During the spring of 1867, beginning April 23, about 30,000 cattle were landed at Cairo. Although most of the animals were slaughter stock and went direct to abattoirs, the disease spread to many native herds in southern Illinois. The river traffic increased and in 1868, Texas cattle landed at Cairo, were shipped eastward by rail in large numbers spreading infection and consternation into the heart of the country from Illinois to Massachusetts.

The experiences of 1868 aroused the livestock men of the North to a realization of the increasing dangers from fever or “Murrain” disseminated by southern cattle and the necessity of taking strong measures against it. State laws were passed and strengthened from time to time—and still the border line of the infected area continued to advance steadily northward and frequent outbreaks occurred in many states. By 1879, cattle owners in many parts of the country were in greatest consternation and alarm.

No one knew of a remedy. No one knew why only southern cattle communicated the plague nor why the disease disappeared in the winter time. No one could comprehend how perfectly healthy southern cattle could convey such a deadly poison to northern cattle, while the northern cattle sick with the malady, seemed unable to transfer it to others.

In 1868, during the extensive outbreak in Illinois, Dr. John Gamgee, an authority from Europe, visiting in America, was induced by the Pork Packers Association of Chicago to investigate the disease and report. His studies began July 29, 1868 and continued until August 4, at which time the Department of Agriculture requested him to continue his investigations throughout the nation. Since some thought forage played a part, Mr. H. W. Ravenel, a botanist of South Carolina, accompanied Dr. Gamgee in his investigations. At the end of ten months or by June, 1869, he reported his conclusions among which are the following:

That southern cattle, especially from the Gulf Coast, are affected with a latent or an apparent form of the disease; that all breeds of cattle in states north of the Gulf Coast, without regard to age or sex, if they feed on grass contaminated by southern droves, are attacked by the splenic fever; that the disease may be, but is very rarely propagated through the feeding of hay; that the disease occurs mainly during hot weather and never after wild grasses have been killed by frost, until spring returns; that then the grasses are healthy and continue so until fresh droves of Texas or Florida cattle are driven over the land and that there is not the slightest foundation for the view that the ticks disseminate the disease.

In 1879, Dr. D. E. Salmon, a young veterinary surgeon, was appointed by the Commissioner of Agriculture, LeDuc, to investigate animal diseases in the southern states with particular reference to Texas cattle fever. Efforts were made to learn the boundary of the permanently infected area, the rate of progression into northern country and the losses sustained along the slowly advancing line.
Although the cause was not determined, young Dr. Salmon learned much of practical value.

The cattle tick with which southern cattle were generally infested had for a number of years been suspected by cattlemen as being connected with the spread of the disease.

Scientific men generally were inclined to discredit the tick theory. Dr. Salmon noted that northern cattle developed the disease when allowed to graze on the trails of cattle from the south or in pastures occupied by them. He felt in order to protect northern cattle that it would be necessary to establish a quarantine line across the country and regulate the movement north of all cattle originating below the line.

By 1883 he succeeded in establishing about two hundred miles of the line extending from the Atlantic Coast westward through the State of Virginia. During 1884 the line was extended to the Mississippi River; in 1885 to the Rio Grand River and in 1895 on through to the Pacific Coast.

The first Texas fever quarantine was issued on July 3, 1889. On February 26, 1892, the Secretary of Agriculture issued an order placing the following states and the Indian Territory (Oklahoma) within the permanently infected area: South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas and Louisiana. The southern portions of the following states crossed by the quarantine line were also included in the order: Virginia, North Carolina, Tennessee, Oklahoma and Texas. In 1894 outbreaks of Texas fever in Nevada, Kansas and Missouri, were reported as apparently caused by cattle originating in California. Investigation proved this to be true and accordingly in 1895 California was included in the infested or quarantined area. The United States Bureau of Animal Industry has continued to supervise the movement of southern cattle since that time.

The order required that cattle from the quarantined area enroute to northern markets be yarded away from native cattle, in separate pens and that cars in which they were transported be cleaned and disinfected before they were again used. This order remained in effect until November 1 of 1889 and was renewed each year.

In 1888 Dr. Theobald Smith first noted the destruction of red blood cells in the blood of cattle sick with Texas fever. Previously in 1886 he noted peculiar bodies in the red blood cells of Texas fever sick cattle. Other experiments being conducted in the nation established the fact that the cattle tick was somehow necessary to the transmission of the disease and finally Texas fever was caused experimentally by putting recently hatched ticks on susceptible cattle which had been protected from any other possible source of infection.

In 1889 Dr. Cooper Curtice reported his experiments on the life cycle of the tick. Dr. F. L. Kilbourne also contributed to this work.

The tentative conclusions drawn in 1888 and 1889 were that:

- Texas fever is a disease not produced by bacteria.
- Texas fever is probably caused by a protozoon living for a time within the red corpuscles of the blood of infected animals.
- Southern cattle without ticks cannot infect pastures.
- Ticks alone, scattered on a pasture will produce the disease in susceptible cattle.
The final experiments conducted in 1892 confirmed earlier reports of 1889-1890 and 1891. On February 6, 1893, Bureau Bulletin No. 1 was issued, giving the cause and nature of Texas fever and the manner in which it is transmitted from infected to susceptible animals.

Others who figured prominently in research work and immunization studies include Dr. Mark Francis of the Texas Experiment Station, Dr. J. W. Connaway of Missouri Experiment Station, Dr. J. C. Robert, Mississippi Experiment Station and Dr. W. H. Dalrymple of Louisiana Experiment Station. Doctors C. A. Cary, Alabama, Charles F. Dawson, Florida, W. H. Dalrymple, Louisiana, J. C. Robert, Mississippi, J. W. Connaway, Missouri, Tait Butler, North Carolina, G. E. Nesom, South Carolina and Mark Francis of Texas, all conducted immunization experiments on an aggregate of four thousand seven hundred and fifty cattle with a loss of 7.6 per cent.

**EXPERIMENTS IN DIPPING CATTLE TO DESTROY TICKS**

In the conclusions drawn following research in 1888 and 1889, one of the factors determined was that "southern cattle without ticks cannot infect pastures". This led to experiments designed to free cattle of ticks. Various substances and combinations were suggested for spraying, dipping and smearing cattle to destroy ticks and were tested between 1892 and 1906.

Under the quarantine issued July 3, 1889, cattle below the quarantine line could be shipped to market for purposes other than slaughter only between November 15 and February 15. This regulation had such a depressing effect upon the cattle industry south of the quarantine line that the discovery of some way to kill the ticks took precedence over practically everything else. Mr. R. J. Kleberg, Manager of Santa Gertrude's Ranch in Nueces County, Texas, designed and built the first vat used by the United States Bureau of Animal Industry in its dip investigations.

The vat was placed at the disposal of the Bureau in 1895 together with the ticky cattle on the ranch. The best results were obtained during the first year from the use of chloronaphtholeum and Lone Star cattle and sheep wash, two coal-tar preparations.

In August, 1897, the Fort Worth Stock Yards Company built a large dipping plant and placed it at the disposal of the Bureau and experiments formerly planned for Santa Gertrude's Ranch were transferred to the Fort Worth Stock Yards.

**BIRTH OF THE UNITED STATES LIVESTOCK SANITARY ASSOCIATION**

It has been generally believed that the parent organization known as the Inter-state Association of Live Stock Sanitary Boards was formed at Fort Worth, Texas, on September 28, 1897. However, in the Report of the Board of Live Stock Commissioners of Illinois for 1892 and covering the year November 1, 1891 to October 31, 1892, pages D102 and D103 the following is recorded:

"Resolutions adopted by the Inter-state Meeting of Live Stock Boards and State Veterinarians:

Resolved: That it is the sense of this convention that tuberculosis in cattle is a dangerously contagious and infectious disease, destructive to human life when the milk or meat of animals so affected are used for human food."
Resolved: That towns, villages and cities, should pass an ordinance requiring all persons who exercise the calling of dairymen and who keep cows for the purpose of selling their milk, or who shall ship milk into such town, village or city, should, before they are allowed to sell or in any way dispose of such milk, procure a certificate from a competent veterinarian to be designated by such corporation stating that the cows in such dairy herd and from which such milk is drawn are free from said disease and that such certificate should be renewed semi-annually, under such penalties as may be fixed by such corporation.

Resolved: That the legislatures of the different states should pass laws requiring all persons who keep cows and milk same and sell milk to cheese and butter factories should procure certificates from some competent veterinarian designated by the Live Stock Sanitary Commission of that state, or other proper official of such state; that their cows are free from tuberculosis and that such certificate should be renewed semi-annually under penalties for failure.

Resolved: That where there is no suitable legislation upon the subject in any state, then the legislature of such state should at once pass ample and sufficient laws for the suppression of the same and place the execution of such laws in the hands of the officers empowered with authority to suppress said disease and that suitable appropriations should be made to carry out the provisions of such laws.

Resolved: That in states where suitable laws for the suppression of said disease have been heretofore enacted, it is the sense of this body that the properly constituted authorities of such state should proceed at once to inaugurate the work of suppressing and extirpating said disease in such states.”

From the foregoing, it is evident that at least as early as 1892 there were group meetings of Inter-state Live Stock Boards and State Veterinarians; possibly research into reports of other state livestock sanitary boards or commissions, may disclose reports of joint action by men in official position in the several states at an even earlier date. Other collateral reading strengthens the opinion that individuals concerned with livestock health in a number of states conferred with each other by meeting together and through correspondence.

In 1897 many of the states had regulations against the movement of southern cattle across their area except during the cold months of the year and the federal government also had established a tick quarantine line which was being violated, several of the state officials were making plans to meet for the purpose of presenting a united request for greater aid from the government in policing the line.

Mr. W. E. Skinner of Fort Worth stated when he met the Sanitary Board of the State of Kansas at Topeka, the question of uniform system of inspection and quarantine was discussed and he asked that the proposed meeting of the sanitary boards, looking to such conclusion, be postponed until such time as he could demonstrate to them something of the results of the experiments he expected at the Fort Worth Stock Yards and he assured them that at that time he would endeavor to secure representation of the Bureau of Animal Industry to supervise such experiments. This was acceded to and the meeting of record was held in Fort Worth, Monday and Tuesday, September 27-28, 1897, to observe a demonstration of the efficiency of the new dipping vat. Accordingly, representatives from Missouri, Illinois, Kansas, Oklahoma, Texas, Colorado and Nebraska, along with representa-
tives of the Bureau of Animal Industry convened at Fort Worth to witness the demonstration.

A resolution was passed providing for the establishment of an Association to be known as the Interstate Association of Live Stock Sanitary Boards.

Another resolution provided for a request to the United States Government for the inclusion of the whole state of Arkansas and Tennessee in the tick quarantine area. At this time the federal quarantine line was located two tiers of counties south of the Missouri state line in Arkansas.

This resolution excited the Arkansas officials, who although invited to attend the meeting at Fort Worth, failed to send a representative and they demanded a hearing before any change was made in the line.

The senator from Arkansas protested to Honorable James Wilson, Secretary for Agriculture, seeking deferment of the inclusion of the two northern tier of counties in Arkansas within the quarantine area.

Other states, notably Missouri, presented evidence of the existence of Texas fever in the area of Arkansas under question and established their state quarantine line at the boundary of Missouri and Arkansas. In the interim, the State of Illinois reached the conclusion that Missouri was right and quarantined against the entire State of Arkansas.

The livestock commissioners from Illinois, Indiana, Kentucky and Tennessee met in Chicago early in November, 1897, to take action against the practice said to be rife in Chicago, of buying and selling horses infected with glanders and cattle with Texas ticks, supposed to be the cause of splenic or Texas fever. Resolutions were unanimously adopted asking that James Wilson, Secretary of Agriculture, call a general convention to meet at St. Louis or some other central point, not later than December 15th. One of the most important subjects for consideration will be the present quarantine law which is objectionable to many of the northern dealers.

MEETING AT ST. LOUIS, DECEMBER 2, 1897

At a meeting of the group held in St. Louis, December 2, 1897 and composed of delegates from Illinois, Missouri, Kansas, Nebraska, Colorado, Montana, Texas and Oklahoma, action was taken asking the United States Department of Agriculture to place its quarantine line for 1898 on the Missouri boundary line. The Department of Agriculture complied with this request. The action was vigorously protested by the Arkansas authorities, claiming that Texas fever infection did not exist in Northern Arkansas; that their cattle were healthy and not dangerous to the cattle interests of other states. Missouri presented evidence to the contrary.

SUBSEQUENT MEETINGS OF THE INTERSTATE ASSOCIATION OF LIVESTOCK SANITARY BOARDS

The second annual meeting was held in Omaha, Nebraska, on October 11–12, 1898, in conjunction with the Trans-Mississippi Exposition. To date we have not found a printed report of this meeting.

The third annual meeting was held in Chicago, October 11 and 12, 1899. A copy
of the report of this meeting is on file in the United States Department of Agriculture, Washington, D.C.

The fourth annual meeting was held on October 2–3, 1900, in Louisville, Kentucky. A copy of the report is on file in the United States Department of Agriculture, Washington, D.C.

The fifth annual meeting was held October 8–9, 1901 at Buffalo, New York. A copy of the report of this meeting will be found in the library of the United States Department of Agriculture, Washington, D.C.

The sixth annual meeting was held in Wichita, Kansas, on September 23–24, 1902. The report of the proceedings of this meeting was never printed. Reference is made to the report of this meeting in the Seventh Annual Report.

The seventh annual meeting was held September 22–23, 1903 at the Brown Palace Hotel, Denver, Colorado. The printed report is on file in the library of the United States Department of Agriculture, Washington, D.C.

The eighth annual meeting was held August 23–25, 1904 in St. Louis, Missouri, and a report was printed.

The ninth annual meeting was held in Guthrie, Oklahoma, August 15–16, 1905. No report of the proceedings of this meeting was printed.

The tenth annual meeting was held August 15–16, 1906, in Springfield, Illinois. A printed report of this meeting will be found in the library of the United States Department of Agriculture, Washington, D.C.

The reports of subsequent meetings are on file in the office of Secretary—Treasurer of the United States Livestock Sanitary Association.

Prior to 1897 it appears the officials of the various states met and were known as Interstate Live Stock Boards and State Veterinarians.

From September 28, 1897 to 1909, the name of the meeting of officials was known as The Interstate Association of Livestock Sanitary Boards.

In 1909 the name was changed to The United States Livestock Sanitary Association.

BIBLIOGRAPHY

ADDRESS OF WELCOME

Hon. Dan. E. Garvey
Governor of Arizona

Mr. Chairman and gentlemen, I am very happy to be here and I feel very honored to be able to welcome you to our State.

To those of you within the State I give a very hearty welcome and to those from outside the State may I extend my hearty welcome also, in the hope that you will enjoy not only your convention but your stay in Arizona.

I have noted with a great deal of interest the purpose of this organization, which includes the study of livestock sanitary science, disseminating information relating thereto, the utilization of laws, regulations, policies and methods for the prevention and control and eradication of transmissible diseases of livestock and maintaining coordination among livestock regulatory officials and serving as a stabilizing factor among the livestock agencies.

Thus, the purpose of your organization has impressed upon me the extreme importance and magnitude of your work. In view of the program that has been drawn up for the protection of our livestock, and the protection of human life throughout this and other states and nations, I hesitate to think of what the present economic health status might be had it not been for the diligent study and continuous efforts of this Association in the control and eradication of livestock diseases.

Whether you entered our State by plane or train or automobile, I know you were much impressed. Many people who travel in our State complain of the fact that they see very little livestock. That is due to the fact that the terrain of our country along the highways is not very amenable to having a large cattle population in that area because of the scarcity of feed and water. However, in the irrigated sections of the State, where there is a good deal of rainfall, we have much cattle. I think Arizona is one of the largest stock producing states in the Union.

Where the concentration of cattle is limited by the nature of our terrain, we are blessed by almost perpetual sunshine. Our great blessing resulting from this means a low disease incidence in our livestock. In this connection may I pay a great tribute to the United States Bureau of Animal Industry, which gives our State sanitary officials unlimited cooperation. Thirteen of the fourteen counties in our State are accredited, and our brucellosis tests show less than 1 per cent infection. The remaining fourteenth county shows a national average of 4 per cent.

When our State was tested for tuberculosis, out of all the cattle in the State there was not one single infection. I think that speaks well for the health conditions of the cattle in our State.

At the last session of our legislature a brucellosis law was passed and proved very acceptable to the industry, under which we propose to rid the entire State of that disease within the next few years.

Our mild climate permits cattle feeding out-of-doors during the winter months and in that way contributes much to the eradication of diseases found in congested...
feeding operations. Just east of this City we have one of the largest cattle feeding pens in the United States.

Recognizing the need of livestock sanitary control and disease control, I can well appreciate the value of this Association to the livestock industry and to the economy of our nation. I am very happy to be with you today and to have this opportunity to send to you our felicitations and greetings and wishes for your pleasant stay here and for your success in the future.

Thank you.
RESPONSE TO WELCOME

R. W. Smith, D.V.M.

Concord, New Hampshire

Mr. Chairman, Governor Garvey, Members of this Association, Ladies and Gentlemen: Since we left Chicago and began visiting various cities in the United States, three up to this time, it has become customary to invite the chief executive of the state in which we hold our convention to give us an address of welcome. At Denver the Governor gave us a wonderful address and a warm welcome; the same was true at Columbus, Ohio, and here in Arizona also.

I wish Governor Garvey had remained for a few more minutes, because I wanted to tell him that if it were not for the good fellowship and the great regard that the members of this organization have for his State Veterinarian, Dr. McMahon, we probably would not have traveled so far to come to Phoenix to meet with them this week. Dr. McMahon extended the invitation two years ago; and because of his sincerity, his good fellowship, his wise counsel, and the fact that we were moving west into cattle country, it was decided to meet here this year.

I am sure that we are going away well repaid for our effort, those of us who have had to travel long distances, for here in Phoenix we find a delightful city, a beautiful country, and we are close enough to the cattle industry so that we can mingle with and talk to those men from the grass roots who are raising the cattle that are so necessary to the economics of our nation.

Someone had said that 80 per cent of the meat producing animals in the United States are grown and raised and owned west of the Mississippi River. By that same measuring stick, 80 per cent of the products from this great livestock country are bought, paid for and eaten east of the Mississippi River.

What does that add up to, just this: The great West, raising a large proportion of the food of our country, is absolutely dependent upon the great industrial East that consumes their products. If it were not for that great industrial East, you would not be raising these splendid animals out here on the prairies. By the same token, remember, too, that if it were not for you here in the West, the wheels of industry in the East would not be turning.

Great as we are here in the United States, in Canada to the north and Mexico to the south, one part of this country could not possibly live and prosper without the other. So, when we come here and meet in convention and mingle with each other, it is to be expected that we will have our differences of opinion, that we will stand up and fight for what we think is right—but it also should be expected that when we see the other fellow has a point, we concede to him. We can expect that when he sees our point of view he will concede to us as well.

We are beginning our 1950 convention. I am sure that out of these next three days in Phoenix we will go back home not only inspired but with a greater knowledge of the task for which we have been called together. In my travels I meet a great many people, as do you. We meet people of industry, people engaged in recreational business, and naturally they are imbued with the great importance of their in-
industry. But I have always claimed and I always shall and thus far I haven't been talked down nor furnished with any figures to dispute my claim, that the agriculture of this country is the greatest industry of all, that we are the number one industry, and without our industry the wheels of manufacturing would stop, this beautiful city would become a ghost city as would all others, and all of us would pass out of the picture.

I have carried in my pocket a paragraph or two that explain just what I mean and just what I believe. I have read it several times, even at this Association, and every time I read it I am besieged with requests for copies. We are in a new territory now, so I am going to ask your indulgence while I read it once more. It is entitled, "I Am A Farmer."

"I am the provider of all mankind. Upon me every human being constantly depends.
"A world itself is built upon my toil, my products and my honesty.
"Because of my industry, America, my country, leads the world.
"Here prosperity is maintained by me. Here great commerce is the work of my hands. Here balance of trade springs from the furrows of my plow.
"My reaper brings food for a day; my plows hold promise for tomorrow.
"In war I am absolute, in peacetime indispensable, my country's surest defense and constant reliance.
"I am the very soul of America—the hope of the race, the balancewheel of civilization.
"When I prosper, men are happy. When I fail, all the world suffers.
"I live with nature, walk in the green fields under the golden sunlight, out in the great Alone where brain and brawn and toil supply man's primary needs, and I try to do my humble part to carry out the great plan of God.
"Even the birds are my companions. They greet me with symphony at the new day's dawn, and chum with me until the evening prayer is said.
"If it were not for me, the treasuries of the earth would remain surely locked. The graineries would be useless frames. Man himself would be doomed speedily to extinction and decay."

Gentlemen, we want to thank Governor Garvey for his gracious words of welcome. We assure him that when we leave Phoenix and the great State of Arizona we will take with us pleasant memories of our sojourn here.
PRESIDENT'S ADDRESS

C. P. Bishop, V.M.D.

Harrisburg, Pennsylvania

Members of the Association and Guests:

At the meeting in Columbus, Ohio, when you elevated me to the presidency of this Association for the current year, you conferred upon me an honor which I deeply appreciate and in addition to the distinction generated by your actions in this respect, I also regard it as a compliment to the Pennsylvania Bureau of Animal Industry which was established May 21, 1895 and which I now have the honor of serving as its director.

This is only the third meeting of the Association since 1908 that has been held at a point other than Chicago, Illinois, and we were delighted to accept the kind invitation extended in behalf of the various groups in this area to hold the Association's annual meeting this year in Phoenix, this beautiful City of the Sun. We trust in heeding the "Westward Ho" call of our friends in this section that we may in some measure pay a tribute to the livestock industry in this great western territory, which through its strong leadership over a period of years in developing the art of raising both beef cattle and sheep, has become a dominant factor in this great American industry.

I am happy on this occasion to extend to new members and others in attendance a most cordial welcome. Your interest in the affairs of this Association is greatly appreciated and it is hoped that you will feel perfectly free to and will, participate in the proceedings of the meeting.

Livestock sanitary officials are constantly confronted with important problems presented by the perplexities attending animal diseases both old and new. The responsibilities with which they are invested began to multiply and develop with the increased growth and development of the livestock industry, which necessitates an ever increasing expansion of transportation and marketing facilities required to meet this growth, which naturally enhance the complexities of control and eradication of infectious diseases.

For more than fifty years, meetings of this association have served the purpose of a forum where problems presented by diseases of livestock and poultry could be freely discussed with a view of developing means for their liquidation. The deliberations of this association with its attending comprehensive committee reports has had much to do with some very outstanding accomplishments in the field of animal diseases that have had far reaching effects upon the general welfare of the livestock industry, public health and the agricultural prosperity of the nation.

These meetings are attended by veterinarians, public health officials, livestock sanitarians, regulatory officials, research workers, livestock breeders, those engaged in livestock loss prevention and the rank and file of those devoted to the principle that healthy livestock is the cornerstone of American agriculture. Fundamentally, agriculture is the basic industry in the national economy of any well balanced nation and livestock farming is most assuredly the foundation of any long range agricultural
program. It consumes a large percentage of our crop and forage resources, aids immeasurably in maintaining the fertility of the soil and provides the highest quality of foods for the human diet. It is the stable core, economically, politically and socially of American agriculture.

The livestock and poultry industries are possessed with ramifications that to some extent affects practically every one directly or indirectly. Yet, in all probability, far too many take the health of livestock too much as a matter for granted.

Many in the industry itself are not aware of the fact that livestock production has been permitted to develop at a rapid pace because it is not handicapped by many destructive diseases that exist in most foreign countries. Still fewer are perhaps familiar with the cost and extent of vigilance required to prevent these exotic diseases from gaining entrance and becoming established with plaguing and ruinous effects to the industry. In spite of this fortunate situation with respect to the diseases which hamper the development of the livestock industry in many foreign countries on a comparable basis to our own industry, there are a number of diseases in this country that exact huge tolls and are responsible for an annual economic loss that is far greater than should be tolerated.

Much of this loss could be reduced through a broader practice of well established and proved prevention procedures. Complacency on the part of some segments in the industry itself and a lack of energetic support in some sections are contributing factors to much of this annual loss, since a number of these diseases lend themselves readily to means available for their eradication. Accomplishments in this particular field of endeavor, however, are contingent upon the degree of support and the extent to which the fighting forces are able to combine their efforts.

Education is, of course, ultra-important in any animal disease control and eradication project, since much depends upon good animal husbandry, proper herd management and the regular daily routine practice of proper sanitation. Veterinarians and the agriculture extension service have a splendid opportunity and are playing an important roll in promoting this phase of the enterprise. I am sure we all recognize and appreciate the valuable service which they are rendering, in addition to contributions on the part of representatives in the agriculture extension service, in handling that portion delegated to them in the promotional scheme of the brucellosis control and eradication project.

While a determined and favorable cooperative attitude on the part of the producer for the suppression of a disease is of paramount importance in the control and eradication of animal diseases, the producer must also recognize the fact that the consumer and public health have a perfect right under our form of government to establish certain protective market demands which the producer must meet if he is to enjoy a ready outlet for his products. Therefore, the producer must realize that with each passing year, market restrictions will continue to increase with respect to both quality and safeness of products intended for human consumption. The trend in this direction is inevitable and the sooner this is recognized the easier the lot will be for each and every one concerned.

During the present international crisis, conservation of livestock becomes an even greater watchword, since an adequate food supply is an equally essential weapon in winning both war and peace. In the interest of disease prevention and
control, it appears imperative that proper and adequate controls be placed on the
sale, distribution and use of all biological products that contain viable or attenuated
micro-organisms. It is believed that the purpose for which these products are in-
tended can best be served when restricted to use by veterinarians or under veterinary
supervision and under the control of livestock sanitary officials in their respective
states who are charged by law with the duties of controlling and suppressing in-
fected diseases of livestock and poultry. Some states now have appropriate laws
and regulations in this respect while in others there appears to be considerable
laxity. There is certainly but a small fundamental difference between shipping dis-
eased animals intrastate or interstate and shipping the causative agent in a bottle.

The unrestricted and promiscuous use of *Brucella abortus* vaccine most assuredly
jeopardizes the control and eradication of this disease. It may be easily misappro-
priated where state and federal indemnities are involved and it seems both unfair
and unjust that state and federal officials should be forced into a situation where
funds for which they are responsible may be improperly expended as a result of
the intentional or unintentional misuse or fraudulent usage of this product.

Time will not permit a coverage of all the subjects engaging the attention of this
Association. However, I am desirous of directing your attention to some of those
that are generally considered to be of special interest and major importance.

RESEARCH

Research is the key to a broader understanding of disease and until the behavior
and peculiarities of a disease is relatively well understood, little or no progress can
be expected in its control or elimination. In other words, projects as they are applied
in disease control and eradication is merely research reduced to practical field
application.

In reviewing the various reports of the Association, it is interesting to note the
strides, growth and developments that have been attained through research. Es-
pecially significant, is the progress made on transmissible diseases of poultry and
such diseases as foot-and-mouth, hog cholera, equine infectious anemia, anaplas-
mosis, brucellosis, hyperkeratosis, bovine tuberculosis, infectious encephalomyelitis,
bovine trichomoniasis, nutritional diseases, parasitic diseases and swine diseases,
including advancements attained in the field of improved biological and pharma-
ceutical products.

While we have accomplished much in these fields, we are still confronted in this
country with many livestock disease problems of scientific and economic importance
that remain unsolved.

FEDERAL AND STATE LIVESTOCK SANITARY SERVICES

Over a period of years this Association has operated on the premise that by the
judicious utilization of available scientific research and a proper coordination of
the efforts of the trained personnel in these governmental agencies, support of the
livestock industry could be secured toward the attainment of a common objective.
That theory continues to motivate the thinking and remains the policy of this
Association.

This tandem hitch is practical and has proved to be successful in achieving a
number of remarkable outstanding accomplishments during almost a half century of team work in this fashion. Accredited veterinarians have become an important cog in animal disease control machinery and the important part which they are and can play is being realized more and more each year. In some states today, more than 90% of all actual field testing is conducted by accredited veterinarians. However, it must be remembered that, as his participation in these programs increase, there is also a corresponding increase in the responsibilities of the accredited veterinarian and he must be willing to assume his proportionate share. It must be further understood that no single group in an arrangement of this character is infallible and no one group is to share in all of the commendations that may accrue, while another is used solely as a cushion to absorb the blame for disappointments that are not strictly within its control. Consequently, when responsibilities are divided it resolves itself into a proposition of share and share alike.

Federal and state officials in charge of cooperative disease control and eradication projects are constituted as such by law and are directly responsible to each respective government for the funds allocated to their disposal and must of necessity have complete jurisdiction over the policies and administrative functions of these offices. In practically all instances the accredited veterinarian, by virtue of his direct contacts as a participant, serves as a liaison between the livestock owner and these two governmental agencies.

**TUBERCULOSIS**

On March 16, 1892, Dr. Leonard Pearson, Dean of the School of Veterinary Medicine, University of Pennsylvania and a former state veterinarian of the Keystone State, applied the first tuberculin test employed in this country. This test was used on a herd of Jersey cattle at the Clearmont Farm near Villa Nova, Delaware County, Pennsylvania. Dr. Pearson was assisted on this occasion by one of his students, Charles E. Cotton, who later became state veterinarian in Minnesota.

It was not until 1917, or approximately one quarter of a century later that this Association considered the opportunity favorable to recommend a plan of procedure that resulted in the inauguration of a national systematic campaign designed to eradicate bovine tuberculosis in these United States. This enterprise was inspired and fostered by various individuals and groups and the movement was launched in face of what appeared to many as a humanly impossible task that would only result in a waste of time, effort and money. However, the optimism that prevailed among the group of pioneers in this gigantic undertaking is responsible in a large measure for the success thus far attained.

A noteworthy observation in this campaign is the rapidity with which it gained momentum after once under way. The interval between accreditation of the first state (North Carolinas) in 1928 and the last state (California) in 1940 was only a brief twelve years. This achievement has not been emulated in animal disease control by any other country in the world and remains a feat to which we point with scintillating pride. I especially wish to emphasize the importance of the amendment to the "Uniform Methods and Rules" presented by the Committee on Tuberculosis, recommended by the Association and adopted by the Bureau in 1949, which provides that on and after January 1951, all cattle within an area, except in range or semi-
range areas, shall be retested within six years following accreditation or reaccreditation of a county before the area can again be reaccredited.

Even though tremendous gains have been made against the common enemy in this instance, I never-the-less am constrained to warn you against any undue complacency and urge you not to become lax, since eternal vigilance must be an essential necessity until the conquest of this disease is an actual reality.

Tracing the origin of cattle that disclose lesions of tuberculosis in slaughtering establishments operating under federal, state or municipal inspection is a phase of the program in its present stage that is ultra important and should be prosecuted to the fullest extent possible.

PUBLIC HEALTH

We are emerging into a new era in our relationship to public health in which an ever increasing responsibility is being placed upon veterinary science, as it applies to animal maladies and parasitic diseases communicable to man. Veterinary science is rapidly becoming a bulwark in the over-all human health program that is now taking shape and veterinary services are being delegated greater responsibilities each year that tend toward creating a safer and more wholesome human food supply derived from animals.

Modern civilization has developed a use and need for milk which has reached a point that requires approximately one cow for every six persons in these United States. Any appreciable interferences or prolonged interruption in this supply would soon result in a calamity of considerable proportions.

BRUCELLOSIS

In all probability, the chief reason why brucellosis eradication has not progressed as rapidly as some have expected, or would like, is due to a failure to recognize the peculiarities of the disease which render it entirely different from all others that we have previously attempted to eradicate.

Science has now disclosed that some of the various distinct classified types of Brucella have more than one common host and as a result, an intertransmissibility of the disease, by types once considered fixed, has now been established which further complicates matters. This discovery directs attention to the fact that in attempting the eradication of any single type of brucellosis due consideration must be accorded all types of Brucella, if successful results are to be expected.

In 1947 a milestone was reached in the control and eradication of this disease on a national basis, when this Association revised the uniform methods and rules which were later adopted in 1948 and recommended to the United States Bureau of Animal Industry which was in turn approved.

Thus the present program is comprised of four distinct plans and recognizes two basic principles or means of approaching the problem. These plans are sufficiently flexible to meet the variable existing conditions that are usually encountered in this vast expanse of land.

Other highly significant events of importance occurring between 1947 and 1949 were the meetings and conferences arranged by Dr. B. T. Simms, Chief, Bureau of Animal Industry, which culminated in the organization of a permanent National
Brucellosis Committee. This committee is composed of 22 nationwide affiliates of the livestock industry and is proving to be an important constructive and influential force in this cooperative enterprise.

The A.B.R. (Ring Test) is rapidly being developed and promises to become an addition to the armamentarium of the livestock sanitarian in the control and eradication of this malady. It appears to have particular potential possibilities in connection with the cooperative county area plan of procedure.

RABIES

Notwithstanding the fact that there was a reduction in the number of rabies cases reported in the United States as a whole in 1949, compared to the years of 1947 and 1948, this dreaded disease commands the attention of this Association and suggests the advisability of more concerted action to effect control procedures for the elimination of this disease. There is probably no other disease in animals that lends itself more readily to available means of control and eradication than does rabies. The one big obstacle today is the lack of a crystalized public sentiment to suppress the disease.

In a number of eastern and southern states, the dog is no longer the primary source of danger in the spread of this disease. Wild life, particularly the fox, has become an important disseminator of the disease and is directly responsible for much of the loss sustained by the livestock industry each year as a result of rabies.

The New York Legislative Committee on Interstate Cooperation and the Council of State Governments has arranged for joint conferences of officials in New York, New Jersey and Pennsylvania during the past year in an endeavor to establish an effective program for the control of rabies in that area. While this action has been attended by accomplishments locally, it points the way to the necessity of a program on a national basis, if real effective advances are to be made in dealing with this subject.

In view of the situation now confronted with respect to this disease, it is urgently hoped that this Association will sponsor and support such legislative action as may be required to inaugurate a national systematic program for the control and eradication of rabies. A program of this character is badly needed and has been far too long delayed.

COMMUNITY SALES OR LIVESTOCK AUCTIONS

The auction system of marketing livestock is perhaps the oldest established method of bartering between buyer and seller. This means of exchange or disposal in the handling of livestock has expanded tremendously in the past decade and has become established as a permanent institution. When conducted properly it, no doubt, renders a useful and valuable service to both the livestock industry and the community it serves. However, these establishments can become a most prolific means of disseminating disease and in many instances they present a serious problem that greatly complicates and often jeopardizes animal disease control and eradication.

The Special Committee on Community Auction Sales of this Association has rendered valuable services in developing numerous practical recommendations.
This committee should be encouraged to continue its efforts in order to stay abreast with the situation.

LIVESTOCK LOSS PREVENTION

Livestock producers in the United States share with the consumer an estimated loss of as high as $25,000,000.00 in a single year in the marketing of livestock, the most of which could have easily been prevented by the exercise of care and the adoption of more humane practices in the handling of animals between the farm or ranch and market centers. The national livestock loss prevention program is sound and well organized and those who have promoted and are directing the activities of the organization are entitled to the highest commendations for their efforts and the results thus far obtained.

POULTRY DISEASES

The poultry industry, which in the sales value of its products ranks very high, is constantly seeking assistance in its disease problems and it is encouraging to note that more veterinarians are displaying a far greater interest in this field than existed only a few years ago.

The incidence of pullorum disease among breeding flocks supplying hatcheries have been reduced to a relatively low degree through increased participation in the "National Poultry Improvement Plan" and other programs adopted in the various states, but the disease is still too widespread to warrant any curtailment of efforts in its control.

Newcastle disease has now become more or less scattered throughout a greater portion of the country and has reached the point where it constitutes an economic burden of considerable proportion to the entire industry. However, there are signs now that we may be on the threshold of new discoveries that may cope with the situation and lead to an ultimate control and elimination of this disease.

DISEASE OF SWINE

Hog cholera is perhaps still the greatest single destroyer of swine, although in some sections swine erysipelas is causing the industry much concern. Slowly but gradually progress is being made in the development of prophylactic procedures against hog cholera that may ultimately eliminate the use of virulent products and eventually pave the way for eradication of this malady.

The excessive annual losses to the pig crop in this country due to a variety of causes, some known and others not, still remains so ridiculously high to command the attention of all concerned.

FOOT-AND-MOUTH DISEASE

Now we come to a disease that is probably responsible for more jitters in the industry and allied interests than any single or combination of diseases. While it has gained entrance to this continent six times during the past half century, it is at this time exotic to the United States. The presence of the disease in the Republic of Mexico has placed the United States in a rather precarious position since 1946. Reports from the Joint Committee, set up by the Governments of the United States
and Mexico to deal with the situation, are indeed encouraging, the details of which will be presented later by Dr. H. F. Wilkins, Chairman, Committee on Foot-and-Mouth Disease.

Congressional action authorizing the United States Department of Agriculture to establish a laboratory on Prudence Island in Narragansett Bay for further research in foot-and-mouth disease will fill a gap that has existed far too long. This will afford a closer and more thorough study of the disease and aside from that, such a laboratory could readily be converted to other uses in times of an emergency.

Consequently, it is hoped that construction on this plant may soon get under way in order that it may be placed in operation at the earliest possible opportunity.

A Committee on Morbidity and Vital Statistics was created in this Association in 1944 and since that time this committee has been actively aggressive in the discharge of its functions and it is hoped that this Association will encourage and expend its efforts toward securing the creation of a Division on Vital Statistics in the United States Bureau of Animal Industry.

It appears that some progress is being made toward more uniform regulations governing the movement of livestock between states, especially among states that are contiguous in the various sections of the country. Regulations in a number of states have been enacted, amended or changed to conform more closely with the National Brucellosis Control and Eradication Project which is indeed encouraging to say the least.

In calling attention to a report of the Committee on Laws and Regulations, which was carried over from the last meeting for further consideration, I trust that careful and unbiased consideration will be accorded this matter.

May I also express the hope that this Association will continue to exert its entire strength and influence in support of Senate Bill 2188, which provides the necessary authority required to enable the Secretary of Agriculture to promulgate regulations covering the movement of cattle in interstate commerce under the brucellosis program, similar to the situation that has prevailed for many years in connection with the systematic control and eradication of tuberculosis.

It is hoped that no effort will be spared to bring the projects now receiving the major attention of this Association to an early fruition, in order that more consideration may be devoted to expanding activities in connection with other diseases that have long been waiting attention.

In conclusion, I wish to express my sincere thanks and appreciation to each speaker who will appear on this program, the arrangement committee and to each member of the various committees who have contributed so generously of their time and energy for the general welfare and success of this meeting.

I also especially wish to extend my respects and appreciation to Dr. Hendershott, our Secretary-Treasurer, who has so ably conducted the affairs of the Association, by his untiring efforts and the indispensable services which he has rendered to me and the membership of the Association.
Mr. President and Members of the United States Livestock Sanitary Association:

This has been a very busy year for the office of secretary. Whenever and wherever possible your secretary has through letter, telegram, telephone and personal appearance endeavored to carry out the mandate of the members of this Association, as set forth in the reports of various committees.

The first order of business of each year is, of course, the publication of the report of the Executive Committee. These reports were in the mail to each of you within fifteen days of the termination of the Fifty-third Annual Meeting.

Next in order was the editing and preparation of material for the printing of the annual report. Eighteen hundred copies rolled off the press in almost record time this year and were completely sold out by August first.

The reasons for the rapid depletion of the stock of 1949 reports were the marked increase in membership, greater demand for copies of the report by libraries throughout the world and of course our failure to anticipate the increased demand by having only eighteen hundred copies printed.

To gain an idea of the rate of growth of our Association one needs but to review the reports of the office of Secretary-Treasurer. It will be seen that this year set an all time record with 755 paid memberships. We should have several thousand and it is my hope that the year 1951 will find our membership above 1,000. I am certain that with your effort the goal will be attained.

Earlier reports of this Association indicate that as late as 1923 only 80 members were carried on our roster. In 1940 we had 125 members, 1941—350; 1942—358; 1943—375; 1944—456; 1945—464; 1946—532; 1947—595; 1948—680; 1949—656; 1950—755.

The size of our annual report has expanded somewhat from the first in 1897 of 26 pages to last year's report which covered 285 pages.

The increase in interest in our Association has been materially reflected in the great increase in the number of pieces of mail which crosses my desk. This is also reflected in the expenditure for postage for the current year which has reached an all time high of $311.00. To carry on, even in the modest way, your secretary has during the past year, required considerable home work.

During the year a reprinting of the pamphlet entitled, "What Is Known About Brucellosis" was necessitated by the increased interest in this publication throughout the United States. While the majority of copies were sent in relatively large orders to state offices, several hundred copies were mailed in filling individual orders. It is hoped that the interest in this most worthwhile publication will continue so that more producers will become acquainted with the basic facts concerning brucellosis. I am certain this publication is having the desired effect and that its distribution and the conduct of meetings on brucellosis throughout the United States is
serving to inform our farm people and to stimulate their interest in freeing their herds of this costly disease.

During the year, it was my privilege to present the report of our Committee on Brucellosis, not only to farmers in my own state, but also, before the meeting of the Virginia Dairymen's Association in Roanoke on January 18, to the Northwestern States Conference in Boise on September 8–9 and to the Commissioners, Directors and Secretaries of Agriculture in Springfield, Illinois during their Thirty-second Annual Meeting, September 17 to 22 last.

On November 29 I went to Chicago to attend the Conference of Research Workers in Brucellosis and spend some time in conference with Dr. B. T. Simms discussing the practicability of our resolution number three, which dealt with the licensed production of multiple dose dried Brucella abortus vaccine.

On January 31 a visit was made to Waverly Press in connection with the printing of the proceedings and a call made to the Bureau of Animal Industry offices in Washington, D.C. to check on the availability of some early reports of meetings of our Association.

On January 18, at invitation, I attended the annual meeting of the Virginia Dairymen's Association and spoke to the group on the Association's recommendation for nationwide control of brucellosis. A committee of the Dairymen's Association, appointed to study brucellosis control programs and make recommendations to their Association, approved the program advanced by the United States Livestock Sanitary Association with one important addition. It was the unanimous opinion of this committee that herds enrolled under Plan C—calf vaccination, without test of any members of the herd, be adjusted to read:

"Calf vaccination without test of any members of the herd shall be continued until,

(a) Fifty per cent of the milking unit is made up of animals that were vaccinated during calfhood, or

(b) Four years from the date of inauguration of the plan, at which time, the owner must select and place his herd under either Plan A or B and proceed to eradicate brucellosis from his herd."

I think all who are seriously concerned about the eradication of brucellosis will appreciate the recommendation of the Virginia Dairymen's Association which sets a time after which reactors must be removed from contact with the herd.

It seems to me that we must publicly recognize the importance of disposing of the infected animal as early as possible if we are to eradicate brucellosis and not give sanction to temporizing methods.

On March 17, Dr. B. T. Simms called a meeting in his office to discuss our resolution number three relative to the production of multiple dose dried vaccine. In attendance at this meeting and representing our Association, in addition to your secretary, were Dr. Ralph West of Minnesota, Chairman of the Committee on Brucellosis; Dr. S. F. Scheidy of Pennsylvania, Chairman of our Committee on Biologics; Dr. H. F. Wilkins of Helena, Montana representing a range and semi-range state, where large numbers of animals are vaccinated at one time. That we were unsuccessful in our mission cannot be charged to the fact that a strong present-
ment of our case, backed with test data, was not made. It is still to be hoped that some adequate solution of this vexatious problem may be accomplished.

On April 20, a trip was made to New York City to meet with Dr. Schroeder, Chairman of our Committee on Mortality and Vital Statistics and Dr. Karl F. Meyer of California to discuss ways and means of advancing the work of this committee. A tremendous amount of work has been done over the past five years by the chairman and members of this committee with whatever assistance your secretary could render to inaugurate a system of reporting the occurrence of infectious diseases of livestock.

It is recognized that while we lead the world in the eradication of diseases of livestock, we certainly trail other areas in the knowledge of the occurrence of infectious diseases and their distribution or incidence and that more definite information is needed if we are to serve the livestock industry in a manner it deserves.

A good example of the inadequacy of our methods of reporting and disseminating information relative to infectious diseases is exemplified in the recent spread of scabies in sheep. One of the greatest stumbling blocks in the setting up of an adequate system of assembling and disseminating information relative to diseases of livestock is the failure of veterinary practitioners to report such diseases to the state regulatory agency of their respective states.

Part of the responsibility for failure of practicing veterinarians to make a report of infectious diseases rests with our educational institutions and they have been requested to indoctrinate the student with the importance and necessity of prompt reporting to the proper state official. The major responsibility for failure to make reports of the existence of infectious diseases rests squarely upon the shoulders of the practicing veterinarian who for one reason or another neglects to do his duty to either the livestock industry or his state by his failure to make a report of infectious diseases encountered in his daily practice.

It appears, that in the final analysis, the veterinary practitioner is denying himself of some valuable information as his failure to make reports prevents anyone from compiling this information and keeping the practitioner informed about existence of infectious diseases in his area.

That the failure of veterinarians to make reports to governmental officials is not condoned by veterinary medicine in this country is borne out by paragraph six of the Code of Ethics of the American Veterinary Medical Association which reads as follows: “Members shall comply with the common law governing their obligations to their clients and shall obey without obvious fault the official public regulations and laws governing their acts.”

Practically all of the states have laws or regulations making it mandatory that any infectious disease of livestock be promptly reported to the responsible state official. Many states promulgate lists of reportable diseases. The states in which reports are filed by the veterinary practitioner, whether he be engaged in large animal practice, mixed or small animal practice are pitably few. I contend that the failure to report the existence of infectious diseases of animals, acts as a brake on the advancement of veterinary science as it prevents the accumulation of information necessary to determine what major problems exist and where research should be instituted to provide the information needed to correct the condition.
REPORT OF THE SECRETARY-TREASURER

It is fervently hoped that through education our young veterinarians and that through the good offices of our state and national veterinary societies, those already enjoying the privileges of veterinary practice, will be embued with the advisability and necessity of complying with the requirement that they make a report of infectious diseases encountered in the practice of their profession, to the end that even greater good will redound to their effort and to the benefit of the people they serve.

On May 25 and 26 the Committee on Agriculture and Forestry of the United States Senate held a hearing on Senate Bill 2188 and your president, secretary and chairman of the Committee on Brucellosis were invited by Senator Guy M. Gillette to attend and present arguments in favor of its passage. The hearing lasted two days, the first being given to those opposed; the second to the proponents. Speaking against the bill were Mr. Joseph Montague, legal representative of the Texas Southwestern Cattle Raisers Associations; Mr. Thomas Arnold of the South Dakota Livestock Sanitary Board and Mr. Clinton Tomson, representing the Beef Breeders Association. Speaking for S- 2188 were Dr. B. T. Simms, Chief and Dr. S. O. Fladness, Assistant Chief of the United States Bureau of Animal Industry; Dr. C. P. Bishop, President; Dr. R. A. Hendershott, Secretary; Dr. Ralph West, Chairman of the Committee on Brucellosis, all of the United States Livestock Sanitary Association. Mr. Paul Bennetch, President of the Brown Swiss Association; Mr. J. H. Ramsberg representing the Holstein Freisian Association of America.

In addition a few organizations and states prepared statements which were included in the record in favor of the bill. It should be stated that the hearing was conducted in a very orderly and impartial manner and the questions asked by the members of the Senate Committee were such that one was impressed with the understanding of the problem evidenced by the committee members conducting the hearing.

It is my understanding that action on this measure is being held in abeyance pending the completion of this the Fifty-fourth Annual Meeting of the United States Livestock Sanitary Association.

At the request of your president, I attended and took an active part in the program of the Northwest States Regional Meeting on Brucellosis. The meeting was exceptional, both from the standpoint of program material and the interest and cooperation exhibited by those in attendance. Several resolutions originated in this group meeting, two of which should receive consideration at this meeting. One requested the Bureau of Animal Industry of the United States Department of Agriculture to give serious consideration to naming a date in the near future after which the production of liquid Brucella abortus vaccine would be discontinued, the other requested the bureau to permit the production of multiple dose dried Brucella abortus vaccine. It was my pleasure to serve on the Committee on Further Development of the Program to Control and Eradicate Brucellosis. Following the meeting several invitations were extended for me to see some of the agriculture of the great Northwest and I accepted the one from Dr. M. O. Barnes of Olympia, Washington and spent a most profitable weekend traveling northward through Idaho and westward to Seattle, Washington. Enroute I learned that Dr. J. C. Norton, our oldest living ex-president, was living right here in Phoenix, Arizona.
For several years I have been annoyed because we had only a very meager history of our Association. You will note from the historical sketch printed in the front of our proceedings that the president and secretaries during the first four years of our existence were unknown. Several years ago I contacted some of the then oldest living members requesting them to prepare a review of our early history. Dr. John W. Connaway dictated some remarks which were presented by Dr. Durant of Missouri. Dr. W. J. Butler promised to assist in this connection but death intervened. Dr. Charles E. Cotton likewise was requested to provide us with a review of the Association's activity during the first two decades of its existence and I understand he is presently working on his report. Unfortunately, when I took over the duties of the office of secretary we did not have a complete set of reports, in fact, we had reports only from 1922. Through correspondence and personal contact we now have assembled a good many of the missing issues. Through the courtesy of the Illinois State Librarian, we can now boast of owning one of the four existing copies of the first meeting held in Fort Worth, Texas, September 27-28, 1897. I know that a second meeting was held in December 1897 at St. Louis, Missouri. Reference is made to this meeting, but no printed report has yet been found.

I am reliably informed that a complete set of reports may be found in the state library at Lincoln, Nebraska and a partial set in the Bureau of Animal Industry library in Washington, D. C. This latter source I have tapped to provide the historical background being compiled. In the Bureau library in Washington, D. C. will be found copies of the annual reports for 1899, 1900, 1901, 1903, 1904, 1906 and so on up to the present. They do not have copies of the reports of the first and second meetings held in 1897 nor of the meeting held in 1898.

From collateral reading it appears the meeting in 1898 voted to be held in Fort Worth, Texas was transferred to Omaha, Nebraska and held in conjunction with the Trans Mississippi Exposition sometime in August. Nowhere have I been able to locate a report of this meeting and I am not too certain about the actual dates on which it took place.

The 1902 meeting was held in Wichita, Kansas on September 23 and the reporter employed to record the proceedings was unable to transcribe his notes, hence no report as such was printed for that year. Dr. William P. Smith, secretary of the Association at the time, made a verbal report of the transactions of the Wichita meeting to the Association in 1903 and presented the Report of the Committee on Line and Open Season by Chairman J. C. Norton of Phoenix, Arizona and the Report of the Committee on Resolutions presented by Chairman Taylor Riddle of Kansas. Dr. J. C. Norton moved that the report of the 1902 meeting be printed in the 1903 annual report if such report was printed.

In 1905, the Ninth Annual Meeting of the Association was held in Guthrie, Oklahoma about the middle of August. Again the reporter had difficulty in interpreting his notes and as a consequence there is no record of this meeting, save a few remarks made by Secretary O. H. Ward of Minnesota, at the 1906 meeting, setting forth the resolutions adopted at Guthrie, Oklahoma in 1905.

Through the courtesy of Dr. R. R. Dykstra of Manhatten, Kansas we now own one copy each of the 1907 and 1908 meetings. Dr. A. K. Kuttler of the Bureau has been helpful in my efforts to assemble a complete set for the secretary's office as have several of the regulatory officials, who responded to my letter for assistance.
Since the report of the initial meeting is so scarce and contains only 26 pages, it is my thought that it should be reprinted as an addendum to the report of this our Fifty-fourth Annual Proceedings. If time permits I should like to continue to develop some of the early history and present it to you. I am hopeful too, that Dr. C. E. Cotton, who served this Association as secretary and then president and who was associated very actively in its work over some thirty-five years, will complete his memoirs so they can be presented when next we meet.

Meanwhile it would be appreciated if any of you hearing or reading this report and having any issues prior to 1924 would be kind enough to donate them to the office of Secretary. As soon as a complete set is assembled they shall be bound, three annual reports per volume, with the hope that a complete record may be passed on to incoming secretaries as the property of the Association.

The report of the Treasurer was presented next.
REPORT OF THE AUDITING COMMITTEE

T. O. BRANDENBURG, Bismarck, North Dakota, Chairman; H. G. GEYER, Columbus, Ohio; A. G. PICKETT, Topeka, Kansas

DR. GEYER: Dr. Brandenburg had to leave, and I will report for him.

Mr. Chairman, ladies and gentlemen, we wish to advise that the Committee has gone over the Secretary-Treasurer's books, and after a careful audit found the accounts in order.

I would like to call your attention to one thing regarding the records of the Treasurer. Until you audit that account you don't appreciate the amount of work the Treasurer does. I don't know how many pages were devoted to the sale of the booklet, "What is Known About Brucellosis". Page after page gave a complete record, showing the name of each individual to whom the booklet was mailed. A tremendous amount of work was involved.

On behalf of the Auditing Committee, as well as on behalf of this Association, we should extend to our Treasurer a vote of thanks and appreciation for the excellent manner in which he has maintained his books.

Thank you.
Since our meeting a year ago in Columbus, God in His wisdom has seen fit to take several of our members to rest with Him. Since it has been a fine, good, Christian practice down through the ages of Christianity to pay tribute and honor to our departed friends, it is quite proper that we should pause for a few moments to pay tribute to those who have gone to their rewards.

This is especially true at a time like this, when a handful of men in another section of the world is attempting to inaugurate a form of government that denies the power of an Omnipotent God. If they have their way, the symbol of the Cross of Christianity will disappear and we will worship and pay tribute to the symbol of the hammer and sickle. God forbid that that shall ever come to pass!

We are told that the greatest minds in the country today are wrestling with that problem, to see that it does not come to pass.

Time will not permit me to pay proper tribute to those who have gone to their reward, and therefore I shall attempt to do what I can in their memory collectively rather than individually, by relating a short story that I heard some time ago. However, before proceeding with that I shall read the names of our departed brothers.

Mr. Fred E. Warren, of Cheyenne, Wyoming. Died May 26, 1950 at the age of 65.
Dr. H. C. Simmons, State Veterinarian of Mississippi. Died March 29, 1950 at his home in Brookhaven.
Dr. Lawrence D. Frederick. Died October 18, 1949.
Dr. Guy M. Smith, of Chicago. Died October 29, 1949 at the age of 56.
Professor J. J. Ferguson, of Clinton, Iowa. Died September 11, 1949 at the age of 75.
Dr. Ward Giltner died July 14, 1950 at his home at Higgins Lake, Michigan, at the age of 68.
Dr. John J. Arnold. Died April 4, 1950 as the result of an airplane accident.
Dr. Banner Bill Morgan, Madison, Wisconsin.

This concludes the list of those whose deaths we have had reported so far this year.

The story I want to relate was told to me some time ago. I think it is most appropriate and fitting in memory of the men whose names I have just read.

A young man, having completed his course in medicine, went out to seek a location in which to establish his practice. He found himself in a small town one day. After searching all day for a place in which to set up his home and office, he stopped at the corner grocery store to rest. He engaged in conversation with the old gentleman running the store, and told him of his problem.

The grocer said, "Perhaps I can help you, Doctor. I have a little room upstairs."
I go up there now and then in the afternoon for a rest. If you would like to use it, you may have it.”

So they went upstairs and found the room, full of junk. The doctor said, “I’ll take it.” After spending some time cleaning it up and putting it in order, he went down the street and had a sign made, “Dr. Brown—Upstairs.” He hung the sign at the foot of the stairs.

As time went on his practice grew and grew. He took an active part in all things of interest in the town. He talked to the boys and girls, telling them how to play games that he had learned at college, and he became one of the most active citizens of the community. Calls were never too far for him to make, the days were never too long, and the nights were never too dark to make a medical call.

He brought babies into the world, took care of the mothers and fathers, and gave what he could in the way of aid and relief to the sick and the dying.

As it comes to all men born on this earth, one day Dr. Brown was called to give an accounting of his stewardship. People came from far and wide to pay tribute to their beloved friend. After the funeral services, some of the folks decided to appoint a committee to erect a monument in his memory. The committee had many meetings, but never were able to agree on just what would be most fitting and proper for his epitaph. So they decided to survey the surrounding monuments in the cemetery to see if they could get an idea of an appropriate inscription. As they approached his grave they noticed a small sign. They drew closer and read, “Dr. Brown—Upstairs.”

Immediately the committee decided that they could not inscribe a more appropriate statement regarding their dear friend, and so that was his monument.

I sincerely trust that our departed friends, like Dr. Brown, are resting upstairs.

Gentlemen of the assembly, I am going to suggest that we stand for a few moments with bowed heads in memory and prayer for our departed brethren.

(Silent standing tribute.)
PRESENTATION OF KEYS TO PAST PRESIDENTS

R. A. HENDERSHOTT, Secretary-Treasurer

Members of the United States Livestock Sanitary Association:

We now come to one of the most pleasant parts of the program for this meeting. A year ago your Executive Committee instructed the secretary to design and have made a suitable key to be presented to all living past presidents. In accord with these instructions, I have designed and had cast a small key, which is suitable for wearing on a watch chain, on the back of which is inscribed the name of the past president and the year in which he served either the parent organization known as the Interstate Association of Livestock Sanitary Boards or the United States Livestock Sanitary Association.

It is regrettable that serious illness in the household of your president, Dr. C. P. Bishop prevented him from being present to personally make these presentations. It is however, a most pleasant task that has fallen to my lot to act for him this morning.

Before I call the past presidents in attendance at this our Fifty-fourth Annual Meeting to come to the rostrum to receive their keys, it might be well for the record if we read the names of all past presidents whom research disclosed are among the living at this time. I shall name them in the order in which they served.

Dr. J. C. Norton, Phoenix, Arizona—1904
Dr. D. F. Luckey, Tarkio, Missouri—1907
Dr. Charles E. Cotton, St. Paul, Minnesota—1910
Dr. Peter F. Bahnsen, Americus, Georgia—1913
Dr. John R. Mohler, Washington, D. C.—1926
Dr. L. Van Es, Lincoln, Nebraska—1927
Dr. A. E. Wight, Washington, D. C.—1930
Dr. Edward Records, Reno, Nevada—1935
Dr. Walter Wisnicky, Fond du Lac, Wisconsin—1936
Dr. Robinson W. Smith, Concord, New Hampshire—1937
Dr. J. Leonard Axby, Indianapolis, Indiana—1939
Dr. A. E. Crossman, Boston, Massachusetts—1941
Dr. I. S. McAdory, Auburn, Alabama—1942
Dr. Wm. H. Hendricks, Salt Lake City, Utah—1943
Dr. J. M. Sutton, Sylvester, Georgia—1944
Dr. C. U. Duckworth, Sacramento, California—1945
Dr. William Moore, Cary, North Carolina—1946
Mr. William J. Miller, Topeka, Kansas—1947
Dr. Jean V. Knapp, Tallahassee, Florida—1948
Dr. T. O. Brandenburg, Bismark, North Dakota—1949

We sincerely regret that all of these men could not be with us today.

You will note that we have twenty living past presidents out of fifty who served in that capacity.

All known to be alive were contacted by letter requesting their presence at this meeting. Replies were received from fourteen expressing regret at their inability
PRESENTATION OF KEYS TO PAST PRESIDENTS

31

to be with us today. Some because of failing health, others because of the distance and quite a few because their work would not permit them to be with us.

It was quite a responsibility to investigate whether or not some of those who served prior to 1920 were still among the living. For quite some time we had no information on the man who is our oldest living past president. Knowledge of his whereabouts was obtained by me on a trip to Boise, Idaho in September to attend the Northwest Group of States Brucellosis Conference. Dr. M. O. Barnes, State Veterinarian of Washington invited me to visit with him and see some of the great Northwest. Enroute we stopped at Lake Lodge in McColl, Idaho and chanced upon the head of the Arizona Extension Service, who in course of after dinner conversation happened to remark about Dr. J. C. Norton of Phoenix, Arizona, whom I recalled was one of our early presidents. Dr. Norton was contacted and is with us today.

Doctor Norton, will you come forward please. Dr. J. C. Norton, in reviewing the early history of our Association it will be found that you attended the Sixth Annual Meeting in Wichita, Kansas, September 23–24, 1902 and served as chairman of the Committee on Line and Open Season.

For the benefit of the younger men in the audience, who may as I did when I first encountered this terminology, wonder what “line and open season” meant. In February 26, 1892 there was a line established by the federal government that extended from the Atlantic to the Pacific, called the Tick Quarantine Line, and all the cattle below that line were under quarantine. It was known that it was possible to admit cattle from below the line to northern areas above the line in a certain time of the year when the ticks were not active, this time was known as the “open season”. Usually it extended from somewhere around the middle of November to the first of January or the middle of March, depending upon weather conditions.

You attended the Seventh Annual Meeting in Palace Hotel, Denver, Colorado September 22–23, 1903 and made a motion that the verbal report of the Wichita meeting be published in the Proceedings for 1903. Thanks to you what report we have of the Wichita meeting was printed.

In 1903 you served on the Committee on Line and Open Season and gave a paper on Cattle Mange and Scabies. You were elected president at this meeting and served as such in 1904. In 1905 you served as chairman of the Committee on Resolutions.

It is noteworthy, that Arizona tick eradication, carried on under your jurisdiction, brought success before many other areas gave serious thought to the problem. Certainly you blazed the trail for sound disease eradication at state level.

It is with hearts filled with pride in your accomplishments as a state regulatory official and thanks to God for His gift of a rugged constitution that has permitted you to be with us today to receive the Association’s token of appreciation of your service as President in 1904. I have the honor Doctor Norton, in the absence of President C. P. Bishop to present to you this key as a memento of your service to the United States Livestock Sanitary Association during 1904, when you served as the eight president of our Association.

Dr. J. C. Norton: Thank you Doctor Hendershott and members of the United States Livestock Sanitary Association. I shall wear this key with pride, thank you.

Our next oldest living past president we are also very fortunate to have with
LIVING PAST PRESIDENTS

Dr. J. C. Norton
1904

Dr. D. F. Luckey
1907

Dr. Charles E. Cotton
1910

Dr. Peter F. Bahnson
1913

Dr. John R. Mohler
1926
LIVING PAST PRESIDENTS

Dr. Leunis Van Es
1927

Dr. A. E. Wight
1930

Dr. Edward Records
1935

Dr. Walter Wisnicky
1936

Dr. R. W. Smith
1937
LIVING PAST PRESIDENTS

Dr. J. L. Axby
1939

Dr. I. S. McAdory
1942

Dr. W. H. Hendricks
1943

Dr. J. M. Sutton
1944

Dr. C. U. Duckworth
1945
LIVING PAST PRESIDENTS

Dr. William Moore
1946

Mr. Will J. Miller
1947

Dr. Jean V. Knapp
1948

Dr. T. O. Brandenburg
1949

Dr. C. P. Bishop
1950
us today. This gentleman, when you read the record of the early work of this Association, gives you the impression that perhaps the Interstate Livestock Sanitary Association was misnamed. I am inclined to think, as we read early records, that perhaps we might well have called it the D. F. Luckey Livestock Sanitary Association, because in almost every phase of our early history we find this young man exhorting the officials gathered in attendance to greater and greater effort, cajoling them into doing some of the things he thought should be done. All of our early history, as far as I can discover, is replete with either his discussions or his activities in connection with this Association.

Dr. D. F. Luckey was president of the United States Livestock Sanitary Association in 1907. Review of the early reports of the Associations reveals that in 1901 Dr. Luckey attended the Fifth Annual Meeting and presented a paper on Texas Fever. In this discourse he stated that he took office of State Veterinarian of Missouri on January 1, 1900 and in reading the various states regulations regarding the line and open season found wide discrepancies in time.

At the 1905 meeting Dr. Leonard Pearson gave a paper on tuberculosis and the diagnosis through the use of tuberculin. Following the presentation of this paper Dr. Luckey in discussing it stated, “It is my opinion that the livestock sanitary boards should develop some regulation making the injection of tuberculin a criminal offense except in those instances where its use is authorized and employed by veterinarians.”

In 1902 Dr. Luckey addressed the Sixth Annual Meeting in Wichita on “The Control of Texas Fever”. This year he was elected Vice-president of the Association. In 1903 at the Seventh Annual Meeting held at the Palace Hotel in Denver Dr. Luckey was scheduled to respond to the Welcome but was absent at the time. He however, arrived at the meeting later and took a prominent part in the discussion on the paper on anthrax by Mr. Thiemann.

At the Eighth Annual Meeting in St. Louis Dr. Luckey presented the Address of Welcome. At the 10th Annual Meeting in 1906 he presented a paper entitled “Obstacles in the Way of Controlling Tuberculosis of Cattle”.

It is a great pleasure, Dr. Luckey, for us to honor you and ourselves by presenting you this pin, indicative of your service to our Association through the years, and with particular reference to the year 1907, when you served us so ably as President. (Applause)

Dr. D. F. Luckey: Thank you, Mr. Chairman. May I say just a word?

I served in 1907 in Richmond, Virginia. At that meeting we sold the idea of tick eradication to the Chief of the Bureau of Animal Industry. Dr. Tate Butler, of North Carolina, a grand man, was very active in promoting that idea and I was just about as enthusiastic, so his good argument and my amens convinced Dr. Melvin that tick eradication was worth trying.

We started dipping cattle in Missouri in 1908. You know the rest. We were about the only two men in the United States who believed that tick eradication was feasible and who had the nerve to tackle the job.

These complimentary remarks by our Secretary make me feel a little like an old farmer friend of mine in Missouri. You fellows living out here in the West fool around with sheep, and won’t appreciate this. (Laughter)
PRESENTATION OF KEYS TO PAST PRESIDENTS

Old man Bovell, a dainty little fellow, had 500 or 600 heavy, purebred sheep. He went to prayer meeting one night and was called upon to make a speech. He said, "I don’t feel worthy. I opened the gate and the sheep got out. I fell down and all 500 of them fell over me, and I said, ‘Dammit.’" (Laughter)

In recent years I have read the Scriptures through and I came to one verse, the substance of which I desire to quote. The sixth verse of Chapter 8 of the Psalms says, in substance, “God made man to have dominion over all the works of his hand.” He didn’t say for us to get rid of glanders and Texas fever, foot and mouth disease and tuberculosis, and let hog cholera continually run riot over this country and take a billion dollars out of the pockets of our hog raisers in the next twenty-five years as it has done in the last twenty-five years and rob a lot of widows and orphans of their meat hogs.

I just wanted to leave an idea with you younger fellows: If you don’t get rid of hog cholera pretty soon, and believe me, it will be the easiest thing we ever did, when you get up to the Golden Gates, Peter is going to ask you about it! (Laughter and Applause)

SECRETARY HENDERSHOTT: Dr. Luckey shows evidence that he is till very active. We shouldn’t have him on the retired list.

DR. CAMPBELL: I would be interested in knowing why he read the Scriptures.

SECRETARY HENDERSHOTT: I am not going to ask him. I, too, wonder, when I see that gleam in his eye, whether he is to the Scripture-reading stage. (Laughter)

DR. LUCKEY: Any man who has not read the Scriptures is not educated. (Laughter and Applause)

SECRETARY HENDERSHOTT: Next, it is my very great pleasure and honor to call upon one of the younger old men, one who is still very active in all of the work of this Association. I didn’t even look up his history. I was afraid that perhaps, way back when, I might encounter something that might possibly not be repeatable in a group of this sort.

I know a lot of things about him from personal association. Some of those things I could speak about, and others I would have to keep quiet about, as I have done for a long time. (Laughter)

He is energetic, and he certainly is diversified in his interests. I don’t know whether he is state veterinarian of his state or whether he is just a good horseman up there. Some years ago, I recall, when I was younger in this Association, this chap held forth at one of our annual meetings with one of his arms in a sling. He tangled with a horse and a sulky. They turned turtle and he ended smashed up. I thought, “He’ll live through this meeting, but shortly we’ll have him on our obituary list.” (Laughter)

He is one of those hardy New Englanders who is hard to kill, hard to down, hard to live with, and hard to get along without. For my money he has been one of the pillars of this Association, and a bulwark of strength. He is one of those leaders to whom we turn for advice on many, many occasions. I have always found him sound in his thinking, an excellent fellow to get along with, and a great nomad. I think there must be some gypsy blood in him. He, probably more than any other man in our Association, can be charged with the fact that we are on wheels, as he says, traveling around this country for our meetings.
PRESENTATION OF KEYS TO PAST PRESIDENTS

The only good thing about it is that although we have membership in Canada and Mexico, he hasn't yet decided that we ought to hold a meeting in either of those countries—but that will be coming, I'm sure. (Laughter)

Dr. Smith, will you come up here, please? It is a pleasure for me, Dr. Smith, in rendering this service for Dr. Bishop, our President, to present you this key as a token of our appreciation of your presidency of this Association, which I am certain every man here knows you well deserve. We will give you just two seconds to say “thank you”, and then you can sit down. (Laughter)

Dr. Smith: Thank you—but I've got to tell a story. (Laughter) After hearing all of the remarks Ralph has made about me, I feel like Maggie did when she attended the funeral of her no-account husband, Pat. They lived in a small community, and Pat was the lowest of all the white people. He was a drunkard and he hadn't supported her and never had done anything right.

When he died Maggie felt that inasmuch as he was the father of her children, she should try to give him a decent burial. None of the ministers in town would officiate, but she scouted around and found one minister who had just come to town. Not knowing Pat, he consented to preach the funeral sermon.

At the funeral he naturally said all the good things he could think of. He said Pat had been a good provider, that he had been a wonderful husband and father and so on and so on. When he finished Maggie reached over to her twelve year old son, yanked his arm and said, “Johnny, go up there and see if that's really your father!” (Laughter and Applause)

SECRETARY HENDERSHOTT: Dr. Smith was President of this Association in 1937. You can see what we had to put up with! (Laughter)

Next in line is our good friend Bill Hendricks, of Utah. Bill, will you come forward, please, so we can see what a handsome ex-President looks like? (Laughter) Dr. Hendricks, as the recent records of our Association show, was another very active state veterinarian, one who participated in the activities of a good many committees. He served as President of this Association in 1943, and did an admirable job, except for one thing: It was during his term of office that the then Secretary decided it was time he got out and made some money for himself, instead of serving as a state regulatory official, so that left the office of Secretary vacant.

The only poor judgment I think this man has ever exhibited was in asking that the State Veterinarian of New Jersey serve this organization as its Secretary for the rest of that term. (Laughter)

I want to say for myself that it was a pleasure for me to serve with him. It was a pleasure for me, as I know it was for all of you, to be associated with him during the years he was active as State Veterinarian in Utah. He, too, found the pastures greener elsewhere, and for the last few years we have been denied the pleasure of his companionship and good will and sage advice in our Executive Committee meetings.

We are very happy to have you with us today, Dr. Hendricks. On behalf of President Bishop and the members of our Association, I want to present to you a well-deserved key as a symbol of your term as President in 1943. (Applause)

DR. W. H. HENDRICKS: Thank you very much. I would just like to say that the experience I have had in this Association is something that I shall always cherish,
PRESENTATION OF KEYS TO PAST PRESIDENTS

and the fine friends I have made are friends whom I would like always to be able to shake hands and mingle with.

As far as Dr. Hendershott is concerned, I am sure I did not make an improper choice when it became my opportunity to select him as Secretary of this Association. He certainly has carried on and has made a success of the work since I left. I am very happy to have been associated with him. (Applause)

SECRETARY HENDERSHOTT: These fellows will begin to think this is an admiration society! (Laughter)

Next in line of those ex-presidents who are with us today is our good ex-President from that great state where they grow real grapefruit (second to Arizona, I hear in the background), Dr. Knapp. Will you come up, please, sir? (Applause)

Dr. Jean Knapp, it is a pleasure for me, on behalf of the President of this Association, to greet you at this time; and to try to expound on your worthwhileness and the great good that you have rendered the Association and are continuing to render, certainly would not be in good taste.

We have been pleased to have you in our midst for a great many years as the regulatory official of Florida. You have been on our Executive Committee. A review of our annual reports reveals how well you have served this Association. I believe the records will indicate that you have been on practically every important committee that this Association has had in the past decade.

In 1948 Dr. Knapp became President of our Association and I think we will all recall the exemplary manner in which he handled the affairs of the organization at our Denver meeting and how well he controlled the Lone Star representatives at that time, and how much fun we had when the Lone Star Republican and the Chair became involved in a little controversy. (Laughter) Such things as that have enlivened the Association and for that we are indebted to you, to be able to have such a keen sense of judgment and humor in handling the job of President as well as you did in Denver.

It has been a real pleasure to serve with you, a pleasure that I will never forget, and I am sure that each regulatory official who has had the good fortune to know you and to work with you will say "Amen" to the fact that we think you well deserve the honor of receiving this Past President's key. May you be with us for many, many years to come. (Applause)

DR. JEAN V. KNAPP: Thank you Ralph. I would like to say that I have served the livestock industry through this Association for over twenty-five years, and it has been one of my most interesting experiences.

Humbly I accept this key in token of the honor that the Association bestowed upon me and will cherish it affectionately for what it means.

I thank you all very much. (Applause)

SECRETARY HENDERSHOTT: Now we come to the "last of the Mohicans". As the Scripture says, "The first shall be last and the last shall be first." It is not because of any inferiority that this gentleman happens to be last. It just so happens that he is a little younger than some others and therefore we can hope he might be with us longer than most.

Here is another man who has been a real bulwark in our Association, who speaks
without fear or favor the things on his mind which he believes to be right, and who has the intestinal fortitude to stand up for the things he thinks are right.

It is men such as Dr. Brandenburg and these other Past Presidents and those who unfortunately could not be with us today, who have made this Association what it is. To those who have gone before, a lot of credit is due them for the programs that we are carrying on today. Those fellows laid the groundwork and bore the burdens. They really blazed the trail, and set the pattern for disease control in this Association and in this nation.

Dr. Brandenburg, we are proud of you because you carried on the high office of President in a very worthy manner during your term as President in 1949. It is a great pleasure for me to present to you this key as a memento of that occasion.

(Applause)

DR. T. O. BRANDENBURG: Ralph says I have five minutes. (Laughter) I was reminded, as I sat watching these various men being honored, of a little incident that happened in our State of North Dakota.

Some of you know that the federal government is putting in one of the largest earth-filled dams in the world on the Missouri River. Naturally, there are all kinds of people working on that dam.

One night, a couple of years ago, there was a brutal murder up there, and the Bismarck Tribune came out the next day with headlines reading, “Brutal Hammer Slaying. Aged Man Fifty Years Old.” (Laughter)

Many of us “old” fellows around Bismarck were so insulted that we called the editor of the paper and said, “How come? Do you think it is good business for a newspaper to insult three-fourths of the men in this city?”

The editor replied, “Well, it’s just one of those things. When you send out a kid reporter that’s what you get.” (Laughter)
Mr. Chairman and gentlemen, I didn’t know that I was going to be called upon to speak. I just came to the convention to see some of my old friends.

I don’t see why you want an old broken-down general to talk to you. That reminds me of an experience in New Guinea. A second lieutenant had been overseas for five years, and about the time the war was over some of his friends said to him, “Bill, what happened? The rest of us are generals or colonels. You’re still a second lieutenant. How come?”

He replied, “Well, I’ll tell you what happened. Soon after we got over here we went out, following the river and we got about three miles from camp and came to a village. The chief and I got along fine. He had a pet monkey and he gave it to me. I took it back to camp. We had a commanding officer who had gone nuts on alerts. Every two or three hours a night he would blow the whistle and everybody would have to get out of bed and get in their planes and stand alert. By the time the engines were warmed up and ready to go he would blow recall and we’d go back to bed.

“About three days after I got the monkey I had trained it to jump in the plane and start it as well as I could. One night I slept through the alert and the monkey went out and started the plane. I heard the planes going over the tent and I ran outside. My plane was last on the line and there stood the commanding officer. He said, ‘Jim, who is in that plane?’ I had to tell him it was the monkey. He court-martialed me on a non-promotional basis. As long as I’m in the Army I can never be promoted.”

The other fellows said, “Gee, that’s bad. We’re sorry for you.”

“Oh,” he replied, “I didn’t mind it so much, but the thing that really burned me up was that after about seven months they made a major general out of the monkey!” (Laughter)

They have asked me to tell you a little about the situation in Mexico. All of you know that this program in Mexico is a scientific program in collaboration with the Republic of Mexico. The area is about the size of California and Oregon combined. If I were talking a little further south and east I would tell you the truth about it—it’s exactly the size of Texas. (Laughter)

There are 17 million susceptible animals in that infected area. Since December 23, 1949 there has not been an outbreak of aftosa. We had the mission to eradicate the disease by the plan of inspection, disinfection, quarantine, eradication and, lastly, vaccination.

We manufactured in our own laboratories in Mexico better than 53 million doses of vaccine, and vaccinated, of the 17 million animals, three-quarters of the area four times, and one-fourth three times, in the southern part. We administered better than 60,113,000 vaccinations to those 17 million animals.

The program continued to be handled just as though it were done in the United
States, plus the vaccination: Inspection, disinfection, quarantine, and eradication. That is the way Dr. Noyes tells me we would do it at home, plus the vaccination in Mexico. In the last two years the collaboration has been good. We have gotten along well with the Mexicans. The Mexican government and President Aleman and Oscar Florez and others have a deep sense of dedication toward eradication.

As we went down the first time as a vaccination team there were forty outbreaks involving about 6,000 head of animals from south to north and north to south. The third and fourth time we went down there were none. We handled the outbreaks just as you would at home, by eradication and disinfecting the premises. There have been more than 100,000 premises cleaned and disinfected in Mexico.

Although since December 23 there have been no outbreaks, we are still watching. The entire efforts are placed on the four points of the program—quarantine, disinfection, inspection, and vaccination.

There are a great many factors still involved in the fight against this disease in Mexico. There are people who tell us that perhaps this is a decline due to a cycle in the character of the disease. I feel that Dr. Noyes and the scientific people have been successful in eradication. We are hopeful that this is true; it probably isn't a cycle, but I don’t believe we can afford, after having spent as much money and time and good will as we have with the Mexicans, to say that the disease was eradicated on December 23 because we haven't been able to find any outbreaks in a year. I think it would be unwise for the Mexican government as well as our own government to say, “It's all over in Mexico.”

One of the things that does really encourage the people who contribute the most to the program is the fact that we have been successful on many occasions in eradicating the disease in this country, and it is entirely logical that we can eradicate it in Mexico. There are many problems still to be solved.

There is a little more anxiety than we had in the midst of the vaccination program. We haven't vaccinated since the latter part of July. As you know, the vaccine had an efficacy lasting approximately four months; in thick and dense infections at that time, so the scientific people tell me, the vaccine would not hold, but in normal field conditions it proved helpful in preventing the spread or at least providing a host for the virus to live in. Working with nature, it is hoped that the disease is dead, and that cleaning and disinfecting the premises may have gotten all of the critical points.

I would like you people of the press to help us a little with our public relations and our international relations. I would like to say this off the record: We believe that foot and mouth disease has been eradicated, but it will take time to be able to say whether we have been successful or not. It is a huge experiment, and I don’t want to build up false hopes among our friends or among you gentlemen here.

The scientific people want to wait a reasonable length of time after immunity has expired, which will be the 15th of November. Then there will be no immunity induced by vaccination in any of the animals in the infected zone.

The scientific people say we should look for the disease for at least a year after the immunity has expired before we can definitely say that there is no athosa in Mexico. We let the immunity expire. We came down from the north and laid a belt of so many kilometers across the north and south ends, and when the four-month
expiration period was up we went back four times. As we did not vaccinate, the immunity ran out the first of March. The immunity coming down progressively, until on November 15 there will be no immunity induced by vaccination.

It has been a lot of fun working with Dr. Noyes and his people. I would like to tell the livestock industry that no man I have ever known has dedicated himself more to his work than has Dr. Noyes of the Bureau of Animal Industry. He believes in the cause and he is working hard. If he is successful, fine. If it is a failure we both will come out and say we did all we knew how to do.

Have a little patience, and maybe within another year we will be able to say that the job is done; at least, if it isn't done, we have character enough to say that we did all we could.

Thank you very much. It was nice of you to ask me to be here.
REPORT OF COMMITTEE ON FOOT-AND-MOUTH DISEASE


Foot-and-mouth disease continues to be enzootic in most countries of the world and constitutes a serious threat to the countries where it does not already exist. The disease invaded another country this year when the livestock industry of Venezuela fell victim to the plague. Otherwise, there have been no marked changes in the world situation from that reported last year.

There has been some virulent spread of the disease in Africa from the area between southwest Africa and Angola (Portuguese West Africa) and in southern Rhodesia. In the area around Alexandria, Egypt, the disease flared up among dairy cattle, affecting up to 50 per cent of the animals in that area. In Austria it was reported that new infection had been brought in from France through the importation of animals destined for food for French occupation troops. The disease continues to be widespread in Belgium and Germany. Five outbreaks occurred in Denmark in the first six months of 1950. Switzerland continued to have periodic outbreaks introduced from outside sources, but in each case the disease was eradicated. In Great Britain there were fourteen outbreaks reported during the first six months of 1950, all of which were quickly eradicated.

The outbreak in Venezuela has been given considerable publicity and has been a matter of general concern, because Venezuela was one of only two countries in South America that had remained free of the disease. The introduction of foot-and-mouth disease into Venezuela was not surprising in view of the fact that importations of cattle, as well as importations of fresh beef, had been permitted from countries where the disease is enzootic. Reports from Venezuela indicate that the disease spread rapidly throughout most of the important cattle growing areas. It does not appear probable that it will be eradicated in the near future.

Colombia, the only country in South America now free of foot-and-mouth disease, has instituted rigid quarantine measures on the border between that country and Venezuela in an attempt to prevent entrance of the disease. In response to a request by the Colombian government for assistance, the Federal Bureau of Animal Industry sent Dr. M. R. Clarkson and Dr. Cesar Clavell to confer with the officials of that country with respect to the measures necessary to prevent introduction of the disease and to control and eradicate it if it should enter the country. As a result of those conferences the Bureau has assigned Dr. Fred Shigley, who has had wide experience with this disease, to assist Colombian authorities in organizing their defenses.

Reports from Uruguay indicate that vaccination against foot-and-mouth disease is becoming more common as a voluntary control measure. However, this work is being hindered by unreliability of some of the vaccine used.

The Netherlands is reported to have instituted a widespread program of vac-
cination and officials there hope to reduce substantially the number of infected farms. Early in June of this year a report was received from The Netherlands that many thousands of susceptible animals had been vaccinated with vaccine prepared from virus grown in tissue culture in their laboratory. According to The Netherlands report, the vaccine was giving satisfactory results.

The propagation of the virus of foot-and-mouth disease in tissue culture media in the laboratory has been studied by Dr. H. S. Frenkel in The Netherlands for a number of years. The present use of vaccine prepared with virus grown by the Frenkel method is an indication of the worth of that experimental work.

If the new method is successful and if it can be adapted to the various types and strains of foot-and-mouth disease virus, it will revolutionize the production of foot-and-mouth disease vaccine by eliminating the need to grow the virus in live cattle. The costs and difficulties of producing the vaccine would be enormously reduced. These include procurement, care, handling, disposal of cattle and cattle products necessary for vaccine production. This method will especially reduce possibility of spread of the virus by confining its handling to a laboratory. Of course, it is still necessary to test the finished product for innocuity and potency, using small numbers of live cattle.

Following the work done by Frenkel in The Netherlands, the Bureau purchased special laboratory equipment and assigned specialists to Mexico, where the Mexican-United States Commission made good progress towards developing the tissue culture techniques, using the Mexican strain of the Type “A” virus. Although it was necessary to discontinue this work before concrete results could be obtained, there was sufficient work done to indicate good possibility of success if it could have been continued longer.

The Mexican situation was favorable as of September 30 when this report was prepared. No new case of foot-and-mouth disease had been diagnosed during 1950, although 219 suspected cases were investigated and laboratory tests made. Ninety-eight of those were diagnosed as vesicular stomatitis (81 New Jersey type and 17 Indiana type). The remainder were other conditions producing symptoms and lesions similar to those of foot-and-mouth disease. Numerous other reports of suspected foot-and-mouth disease were investigated, but the cases were of such a nature that a field diagnosis could be made, thus eliminating the need for laboratory tests.

During the foot-and-mouth disease campaign in Mexico, 1,644,619 doses of vaccine were purchased from Argentina, Switzerland, The Netherlands, and Denmark and a total of 53,324,000 doses were manufactured by the Joint Mexican-United States Commission, making a total of 54,968,619 doses available for the vaccination phase of the program, which ended July 31, 1950.

The largest number of animals vaccinated during any one month was 5,052,811 in January, 1950. These figures give an idea of the magnitude of the program. Since the cessation of vaccine production, virus on hand in the laboratories in Mexico City has been destroyed and the production facilities thoroughly cleaned and disinfected and then tested with susceptible animals.

The cost of the Mexican program has been very great. The United States alone had obligated more than 120 million dollars as of September 30, 1950. Costs to
Mexico would swell that figure considerably. However, additional knowledge has
been gained about the disease and the threat to our own livestock industry pre-
sent by the outbreak in Mexico has brought a new alertness to the dangers of
foot-and-mouth disease. We may expect that this alertness will go far to ensure
that any introduction of the disease into this country will be detected and reported
promptly, so that the state and federal control officials can go into action quickly
and eradicate the outbreak before it has opportunity to spread.

An inspection of the Bureau's border patrol is ample proof to almost anyone that
the border is being watched in an effective manner. The inspection maintained on
the border gives confidence that there is adequate protection against the movement
of prohibited animals or animal products into this country from Mexico. A full
report on the border patrol would require a too lengthy dissertation to be incorpo-
rated in this report, but in the near future it should be written up in detail for the
benefit of the members of this Association and others.

The apparent success of the eradication program in Mexico should not cause
any lessening of the vigilance which must be maintained at all times against the
introduction of foot-and-mouth disease into the United States or Canada.

This is a never-ending task, which is difficult enough in normal times when the
hazards are those of accidental introduction of the virus. The task is made infinitely
more difficult in time of emergency, when the possibility of planned introduction
of one of the exotic diseases must be considered.

The Bureau of Animal Industry in the United States, and the Health of Animals
Division in Canada, maintain close watchfulness at all ports of entry, to exclude
dangerous livestock and fresh meats from countries where foot-and-mouth disease
exists and to carefully supervise importations of hides, skins, glands for pharmaeue-
tical purposes and other animal by-products, to see that the manufacturing processes
are sufficient to destroy any virus of these diseases that might be present.

Earlier in this report mention was made of the alertness of the livestock industry
as a result of the outbreak in Mexico. It is essential that all members of this organi-
ization continue to urge everyone connected with the livestock industry to be alert
for evidence of foot-and-mouth disease or other exotic diseases and to report any
suspicious cases immediately to state, bureau or dominion veterinarians. The key
to successful eradication is early discovery of the disease, followed by prompt and
vigorous eradication methods. Plans have been worked out for immediate investi-
gation of such reports by veterinarians, specially trained for the purpose and fur-
ther plans have been perfected for immediate action to eradicate any outbreak.

Your Committee offers the following recommendations:

1. That the foot-and-mouth disease eradication program in Mexico continue to
receive the full support of the Congress and the people of the United States, until
brought to a final successful conclusion.

2. That this organization continue to favor the construction of additional fence
along the Mexican border and that the border patrol be maintained in keeping with
existing dangers.

3. That all livestock sanitary organizations, livestock owners, veterinarians and
other concerned with the livestock industry, be impressed with the seriousness of
the world situation and with the necessity for them to be prepared to give adequate
and immediate assistance to bureau and state personnel in the detection and diagnosis of any suspected cases and the control and eradication of any outbreak of exotic diseases of animals and poultry.

4. That adequate means be maintained at coastal ports to continue the enforcement of present regulations concerned with the prevention of the introduction of animal and fowl diseases from foreign countries.

5. That this Association memorialize Congress to provide funds for facilities in this country for the study of foot-and-mouth and other virus diseases including prophylactic vaccination and for continuing such studies abroad.
PROBLEMS OF THE LIVESTOCK INDUSTRY CREATED BY ATOMIC EXPLOSIONS*

WRIGHT H. LANGHAM, B.S., M.S., PH.D.†

University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico

INTRODUCTION

The fact that the United States no longer holds a monopoly of atomic weapons is adequate justification for various industrial and economic groups to give serious consideration to the problems posed in their specific fields by an atomic detonation. Realization of the need for wider dissemination of knowledge of atomic weapons in the interest of science and civil defense has resulted in the Department of Defense and the United States Atomic Energy Commission preparing and releasing under the direction of the Los Alamos Scientific Laboratory a book entitled, “The Effects of Atomic Weapons”. This book gives a thorough and authentic description of the physical phenomena associated with atomic explosions insofar as national security will permit at the present time. The majority of the material presented in the present report was condensed from the above publication.

The atomic bomb is a new weapon of great destructive power. It resembles bombs of the more conventional type insofar as its explosive effect is the result of the very rapid release of a large quantity of energy in a relatively small space. It differs, however, from other bombs in three important effects: first, the amount of energy released by an atomic bomb is a thousand or more times as great as that produced by the most powerful TNT bombs; second, the explosion of the bomb is accompanied by highly penetrating and deleterious invisible rays in addition to intense heat and light; Third, the substances which remain after the explosion are radioactive, emitting radiations capable of producing harmful effects to living organisms.

The principle destructive effects of atomic weapons are attributable, therefore, to three phenomena: blast, thermal radiation (incineration) and nuclear or ionizing radiation. Casualties from blast may be produced in two different ways—by direct action of the shock pressure on the animal system resulting in pulmonary hemorrhage, ruptured ear drums, etc., and second, by indirect action resulting in traumatic injuries from collapsing buildings, flying debris, etc. Thermal radiation may also produce casualties by direct and indirect means. In the former case the direct thermal radiation released by the bomb is of sufficient magnitude to produce serious “flash” burns at relatively great distances from the explosion. In the latter case, the kindling of fires in inflammable structures, igniting of gas from broken gas mains, etc. results in numerous injuries from ordinary thermal burns. Casualties produced by nuclear ionizing radiations may result from the “prompt” radiation (that emitted within one minute after detonation) or from delayed radiation emitted by “fission fragments” deposited in the immediate area by the detonation or de-

* Work done under the auspices of the AEC.
† Director of Bio-Medical Research, Los Alamos Scientific Laboratory.
posed over a wide area as a result of "fall out" from the atomic cloud as it travels with the prevailing winds.

The relative importance of the above factors with regard to the production of total casualties is extremely difficult to evaluate because of the overlap in their destructive areas. Various attempts were made, however, to evaluate the relative casualty production resulting from the Japanese bombings. One such estimate, taken in part from the United States Strategic Bombing Survey\(^\text{a}\) is given in Table I. Obviously the relative effects of blast, thermal, and ionizing radiations are entirely dependent on the height of the detonation, the type of construction in the bombed area and the total energy release of the bomb.

A more detailed discussion of the various casualty producing phenomena of an atomic explosion is given in the following pages.

**TABLE I.—Relative Number of Casualties Produced From Various Bomb Phenomena at Nagasaki and Hiroshima**

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>PER CENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast (both direct and indirect)</td>
<td>30-40</td>
</tr>
<tr>
<td>Thermal Radiation (both direct and indirect)</td>
<td>50</td>
</tr>
<tr>
<td>Nuclear Radiation (prompt)</td>
<td>10-20</td>
</tr>
<tr>
<td>Nuclear Radiation (delayed)</td>
<td>0</td>
</tr>
</tbody>
</table>

**BLAST EFFECTS**

In Japan the number of casualties produced by the direct action of the blast was extremely small. The blast pressures necessary to produce serious injury to large animal organisms is estimated at between 35 and 100 lbs. per sq. in. overpressure. Fig. I shows a graph of the shock pressures produced by a nominal 20 kiloton atomic bomb explosion (one equivalent in energy release to 20,000 tons of TNT) as a function of distance. In this figure the peak overpressures of the shock in lbs. per sq. in. are plotted against distance from the explosion in feet. From this graph it can be seen that pressures greater than 35 lbs. over normal atmospheric pressure is obtained only at distances of less than 1500 feet from the bomb. The lack of direct casualties from the blast at Nagasaki and Hiroshima is quite possibly due to the fact that the bombs were exploded at heights of the order of 2000 feet. Also, any casualties near enough to receive direct blast injury would be sufficiently near the explosion to be killed by the intense heat as well as by the nuclear radiations emitted by the bomb. It is, therefore, reasonable to assume that little serious consideration should be given to the treatment and care of casualties produced by the direct action of the shock wave itself.

Casualties produced by indirect action of the shock wave may, however, be looked upon as one of the largest problems to be encountered as a result of atomic explosions. The shock wave itself, especially from an air-burst atomic bomb is, from the point of view of weapon delivery and disruptive effect, the most important agent in producing destruction.

The atomic Weapons Effects Manual\(^\text{1}\) referred to earlier indicates that steel
frame and brick buildings may be destroyed at peak overpressures of 7 to 8 lbs. per sq. in. These pressures occur at distances of approximately 3/4 mile from the point of explosion of a nominal 20 kiloton bomb. Partial damage to wood structures may occur at peak pressures of two lbs. which occur at a distance of approximately 1-3/4 miles. Obviously then numerous casualties will be produced from collapsing buildings and flying debris up to distances of 1-3/4 miles from the center of the explosion. The nature of the injuries sustained do not differ qualitatively from those produced by conventional bombs. They consist of cuts, abrasions, fractures, and other traumatic conditions. The difference between the two types lies primarily in the far greater number of casualties following the atomic bomb explosion.

Fig. 1.—Peak overpressure in Shock Wave as a Function of Distance from Atomic Explosions.
Because of the high temperatures obtained in an atomic explosion the bomb resembles the sun in the respect that a very large amount of energy is emitted as thermal radiation. With a conventional high explosive bomb not only is the total energy release much smaller, but the proportion of energy that appears as radiation is also very much less than for an atomic explosion. Consequently, the thermal radiation effects of a conventional bomb are insignificant, but in an atomic explosion they are of great importance. One of the striking factors connected with the atomic bombings in Japan was the large number of casualties attributed to what have been called “flash” burns.
Human skin will show slight to moderate "flash" burns from 3 calories of thermal energy per sq. cm. Wool fibers, on the other hand, will burn with 7-10 cal. per sq. cm. Fig. II shows the distance from an atomic bomb explosion at which definite amounts of thermal energy are delivered as a function of energy release of the bomb. These results show that 3 cal. per sq. cm. of thermal energy (enough to produce slight "flash" burn of the skin) may be delivered at a distance of over two miles by a nominal 20 kiloton bomb. At a distance of 1-1/2 miles wood, paper, wool and many other materials will be ignited.

The casualties produced by indirect or secondary effects of thermal radiation result from the ignition and incineration of wooden buildings and other combustible materials which may trap casualties in the conflagration. Obviously casualties produced in this manner, although very great in number, do not differ in manner of care and treatment from the casualties produced by any other catastrophe resulting from fire.

The "flash" burns observed at the greater distances in Japan were largely confined to exposed parts of the body or to skin areas where the clothes were tightly drawn. It is very possible that the nature of the hair of domestic animals will afford considerable protection from such burns especially at distances beyond a mile from the explosion. There is little information that would indicate any drastic differences in the injurious effects or mode of treatment of "flash" burns from an atomic detonation as compared to more conventional types of burns. In fact, the depth of the burn in the former case is frequently not as great because of the very rapid delivery of the energy.

NUCLEAR OR IONIZING RADIATION

As mentioned earlier the explosion of an atomic bomb is accompanied by the emission of invisible deleterious radiations. These radiations consist of gamma rays, neutrons, beta particles and alpha particles, all of which produce similar biological effects in living matter. A large proportion of these radiations are emitted within the first minute after the bomb detonation and are frequently referred to as "prompt". The remainder of the radiation is associated with residual plutonium or uranium and "fission fragments" which may be deposited in the immediate area of the explosion or which are carried up in an atomic bomb cloud.

The nuclear radiation phenomena is the one unique feature of an atomic weapon. For this reason it has received the most emphasis, both by the lay press and by the medical and atomic scientists. A detailed description of the biological effects and the significance of each type of radiation cannot be given in a short report of this type. It is, therefore, necessary to eliminate the less important radiations with as little discussion as possible.

Alpha particles, although having relatively great energies, have such a large mass that they are unable to penetrate the horny layer of the skin and are, therefore, of little biological significance unless taken into the body through cuts, abrasions, by inhalation or ingestion.

Beta particles are considerably more penetrating and will penetrate the skin to a depth of about 1/2 inch depending upon their energies. Beta particles may, therefore, produce serious skin burns if the fission products that emit them are allowed
to remain on the body surface. They may also produce chronic damage if the fission products are taken into the system by inhalation, injection or other means.

Neutrons are much more penetrating than beta particles and are capable of producing significant biological effects within a distance of 600 to 800 yards from the center of explosion of a nominal 20 kiloton bomb. The effects produced are essentially the same as those produced by gamma rays.

From the point of view of the production of casualties the gamma rays are far the most important. Fig. III shows a plot of the gamma ray dose in roentgens as a function of distance from a nominal 20 kiloton explosion. The roentgen is the unit

![Graph showing total dosage of initial gamma radiation as a function of distance from atomic explosion.](image)

**Fig. III.**—Total Dosage of Initial Gamma Radiation as a Function of Distance from Atomic Explosion.
of measurement of X- or gamma radiation and the median lethal dose of gamma rays for man is believed to be of the order of 400 roentgens. Fig. III shows that a

<table>
<thead>
<tr>
<th>Time After Exposure</th>
<th>Lethal Dose (600 R)</th>
<th>Median Lethal Dose (400 R)</th>
<th>Moderate Lethal Dose (300-100 R)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First week</strong></td>
<td>Nausea and vomiting after 1-2 hours</td>
<td>Nausea and vomiting after 1-2 hours</td>
<td></td>
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<tr>
<td></td>
<td>No definite symptoms</td>
<td></td>
<td>No definite symptoms</td>
</tr>
<tr>
<td></td>
<td>Diarrhoea</td>
<td>Diarrhoea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
<td>Vomiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inflammation of mouth and throat</td>
<td>Inflammation of mouth and throat</td>
<td>Loss of appetite and general malaise</td>
</tr>
<tr>
<td><strong>Second week</strong></td>
<td>Fever</td>
<td>Beginning epilation</td>
<td>Epilation</td>
</tr>
<tr>
<td></td>
<td>Rapid emaciation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mortality probably 100 percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Third week</strong></td>
<td>Fever</td>
<td></td>
<td>Loss of appetite and general malaise</td>
</tr>
<tr>
<td></td>
<td>Epilation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of appetite and general malaise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sore throat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pallor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Petechiae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fourth week</strong></td>
<td>Pallor</td>
<td>Diarrhoea</td>
<td>Diarrhoea</td>
</tr>
<tr>
<td></td>
<td>Petechiae, diarrhoea and nosebleeds</td>
<td>Moderate emaciation</td>
<td>(recovery likely unless complicated by poor previous health or superimposed injuries or infections)</td>
</tr>
<tr>
<td></td>
<td>Rapid emaciation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Mortality probably 50 percent)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
trons and/or gamma rays. The large number of casualties observed is attributable to the great penetrative power of the radiations. Persons who were within one mile of the explosions and who were protected in various ways from the thermal and blast effects later developed symptoms of radiation sickness.

There is little direct information on the median lethal dose of gamma rays for various domestic animals other than dogs and swine. The indications are that the median lethal dose for the various large domestic animals is approximately that of man. The median lethal dose for swine is in the range of 300 to 400 roentgens.

Table II presents schematically the symptoms of radiation sickness and the time sequence of their occurrence as observed in the Japanese casualties. The poor prognosis of the casualties seemed to correlate with the early onset of symptoms. The symptoms of radiation sickness in domestic animals are essentially the same as those observed in man.

There are no sudden spectacular symptoms of radiation disease. The symptoms consist of early nausea and vomiting, followed by a period of no definite symptoms, followed in turn by diarrhea, vomiting, inflammation of the mucous membranes, fever, perhaps loss of hair, loss of appetite, blood changes, hemorrhage, emaciation and death. The length of the survival period may vary from a few days to six weeks. Animals surviving longer than six weeks have a good chance of permanent recovery. At present the best methods of therapy seem to be whole blood transfusion, use of antibiotics and rigorous nursing care.

The above discussion applies principally to acute radiation damage resulting from the "prompt" radiation emitted within the first minute after the explosion. There are, of course, delayed effects from a single acute exposure which may manifest themselves over a period of years in various ways, such as shortening of the life span, the occurrence of malignant growths, formation of cataract and occurrence of premature aging. A detailed discussion of the delayed effects of radiation does not seem to be appropriate in this report.

Of more specific concern to the animal industry may be the semiacute or chronic exposure resulting from delayed radiation emitted from the fission products remaining after an atomic blast or from the atomic cloud. The amount of fission products remaining in the immediate area of an atomic explosion is dependent upon the height of burst above the ground. A bomb explosion at a height of about 2000 feet, as was the case with the Japanese bombings, would leave an insignificant amount of fission product contamination in the immediate area. Ground surface or subsurface atomic explosions would undoubtedly contaminate the immediate area with fission products to such an extent that it would not be safe for inhabitation for several days. An underwater burst, comparable to the second explosion at Bikini, may also result in rather serious and widespread contamination of everything down-wind from the explosion for a distance of several miles.

The problems associated with the "fall out" from the atomic cloud produced by a low-level detonation were demonstrated by the first atomic bomb explosion near Alamagordo, New Mexico. There were small areas several miles down-wind from the explosion where sufficient "fall out" occurred to be of biological importance. In fact, the deposition of fission products from the explosion on the backs of cattle grazing in these areas resulted in their receiving sufficient beta radiation of the skin
Fig. IV a, b.—Beta Radiation Burns on Backs of Cattle Caused by Deposition of Fission Products from Cloud Produced by the Alamagordo Atomic Bomb Test.
to produce ulceration, thickening and loss of hair. When hair grew back it was white or gray. Fig IV. shows a picture of the type of damage received by some of the cattle in the Alamagordo area. Sacrifice and autopsy of some of the animals revealed no indications of internal damage and radioactivity assays of their tissues indicated no measurable ingestion of “fission” products from the bomb. No indications of damage were observed in the offspring of these animals.

DISCUSSION

Some aspects of the problems created for the livestock industry by atomic explosions have been presented in an excellent article by J. H. Wilkins entitled, “Atomic Warfare and Animals”. It is hardly likely that concentrations of cattle will ever be the primary target of an atomic bomb. It is possible, however, that large numbers of animals could be subject to damage because of the proximity of stockyards to some of our leading industrial cities. As a specific example, one may consider the City of Chicago. It is conceivable that the Chicago stockyards could be hit by an atomic detonation aimed at destroying the industrial war potential of this rather important American city. The type of construction of which stockyards are made would make them subject to considerable damage by blast, resulting in numerous animals receiving cuts, abrasions, fractures and other traumatic injuries if an air burst of a nominal 20 kiloton bomb occurred within a distance of 2 miles. There may also be considerable casualties from “flash” burn and especially from secondary fires because of the great amount of wood construction used in stockyard facilities.

A large number of casualties would result from radiation sickness if the stockyards were within one mile of a nominal 20 kiloton explosion. Such concentrations of domestic stock, of course, would be subject to serious fission product contamination from “fall out” resulting from the atomic cloud in the event of a surface or sub-surface ground burst or an underwater burst occurring in an adjacent body of water such as Lake Michigan.

The disposition of animals injured by an atomic detonation would, of course, create problems for the livestock industry. The disposition of animals receiving traumatic injury and serious burns is not new to persons engaged in the livestock business. These animals could be disposed of in the usual way.

Animals receiving radiation damage either directly or from “fall out” would confront the industry with a new situation. The casualties produced by prompt radiation unaccompanied by “fall out”, as would occur from air burst, would not be sufficiently contaminated to be dangerous for veterinarians and handlers to work with. In the event that symptoms of radiation sickness appeared within the first week disposal of the animal is indicated. Occurrence of symptoms during the second week may indicate the possibility of a fifty per cent survival. Animals showing no symptoms for three weeks may be assumed to have a good chance of recovery. Animals to be disposed of may be disposed of in the usual way.

Casualties highly contaminated with fission products, as may occur from “fall out” from a ground surface, sub-surface or underwater detonation, would have to be washed down with a high pressure stream of water and may have to remain unattended for several hours before significant radiation exposure of attendants
could be avoided. Such animals would pose a more serious disposal problem. Sacrifice and burial in a manner to avoid large radiation exposure of handlers would seem advisable.

Less serious cases of "fall out" contamination as occurred at Alamagordo would not create a serious problem justifying sacrifice of the animals. It is quite possible that the Alamagordo cattle would not have been damaged at all had it been known that radioactive material had been deposited on their skin. Washing the animals thoroughly with a high pressure stream of water soon after the material was deposited on their skins might have prevented any visible damage.

It should be noted that the amount of radioactive material involved in the "fall out" from an atomic detonation is usually small relative to the radioactive products which are handled regularly by Atomic Energy Commission installations. If we should grow careless, this would present a definite hazard. However, these installations are putting forth great effort to control waste disposal processes so that there will not be any contamination of the surrounding country. Such contamination could be easily detected by appropriate and rather simple radiation detection procedures.

**SUMMARY**

1. A discussion of the radius of blast, thermal and ionizing radiation damage resulting from a nominal 20 kiloton atomic explosion has been presented.

2. The casualties produced among domestic animals by an atomic explosion will not differ symptomatically from the casualties produced in a human population.

3. It is doubtful that large concentrations of domestic animals will ever be the primary target for an atomic bomb. It is, however, recognized that stockyards in cities of great industrial importance may be hit by atomic bombs.

4. Disposition of casualties among domestic animals is discussed briefly.

**REFERENCES**


DISCUSSION OF DR. LANGHAM’S PAPER

CHAIRMAN MOLLIN: Thank you very much, Mr. Langham for a splendid presentation.

VOICE: How do you explain tumors that occur on swine? We use x-rays to eliminate such lesions.

MR. LANGHAM: This is not an unusual occurrence. For example, nitrogen mustard is known to be mutagenic and produces somatic mutations that may produce malignant growths, yet at the same time it has a deleterious effect on the tumor itself. This is one of those cases where you can use a poison to fight a poison, so to speak. It is common practice to treat malignant growths with x-rays—yet it is also a common practice to produce malignant growths with x-rays and radiations of other kinds.

SECRETARY HENDERSHOTT: Let’s consider these animals that you know are going to be dead next week or the week thereafter, or those in the second group, which might linger on, some recovering and some dying. Suppose we wanted to harvest that meat. Could we slaughter those animals and would that meat be deleterious to anyone who would consume or handle it?

MR. LANGHAM: If we are talking about an animal that is sick from acute radiation and that has not been contaminated by fallout, I think probably in the case of an emergency one might use the meat of the sick animal, so to speak, for food. I doubt if the health safety standards would permit you to do this if there was not an emergency.

I might say that in that first group of animals you probably would find the health safety organizations not permitting you to use the meat, because it is using essentially a sick animal.

If an animal is in the third group, sick but certainly able to be nursed back to good health, I see no reason why it should not be used for food.

In the case of animals seriously contaminated from fallout, such as from an underwater burst driving across a stockyards area, the fur of those animals would be so contaminated that I doubt if they could be harvested for meat because of the exposure of the meat handlers themselves; and even though it is only the hide of the animal that is contaminated, probably in the process of skinning the animal you would contaminate the meat enough so that I am sure the civil defense authorities, and so on, probably would not let you use it for meat.

VOICE: Will the Geiger counter be available at economical cost to provide one for each slaughterhouse?

MR. LANGHAM: I would say yes. Civil defense is forcing them to build these things by the thousands, and relatively cheaply. For example, I think you can probably get a Geiger counter now for $20 or $30. The principle thing wrong with them is that they are very temperamental, and you need half a dozen, because at least half of them won’t work at any one time. When this thing is remedied I am sure before long a Geiger counter will be available to anyone who has any use for one.

DR. O. SUSSMAN: Tell me the difference between an animal that has fallout on it, on which you use a Geiger counter and get a “positive”, which can be washed
DISCUSSION OF DR. LANGHAM'S PAPER

off, as compared to an animal that gets an initial dosage and eventually sickness. There is no method of determining that in advance, is there? Could we take a blood count and watch the level of the count?

MR. LANGHAM: That is right. The sickness of the latter variety, which you are talking about, was produced by the gamma rays emitted promptly at the time of the burst, which go into the animal. The animal's cells are damaged, and there is no residual radiation remaining. In other words, the damage has been done, and the only thing to do is to observe the symptoms of the animal, which will tell you the degree of damage that animal has received.

VOICE: Then, within an area of a bomb from the standpoint of the livestock industry, if you knew where the animals were in relation to the bomb, and if you knew how far the gamma rays would go, if there is no positive on the Geiger counter you would not have any contamination in the skin.

MR. LANGHAM: That’s right.

VOICE: In line with Dr. Hendershott’s suggestion, before the sickness occurred there would be no actual visible evidence of sickness in the animal. Would there be any hazard to the consumption of that meat?

MR. LANGHAM: I would say there would be none.

VOICE: Then there should be some system worked out so that we can find out whether the outside is contaminated and yet have available a great deal of meat.

MR. LANGHAM: This is very simple to do. An animal that is not sick and does not show radioactivity on the body surface, as indicated by a Geiger counter, should be perfectly usable as meat.

This may be one way of solving a situation of this kind, that is, if the distance is indicated that the animals may have been damaged by radioactivity and there is no contamination of radioactivity on their body surfaces, then maybe the thing to do is to butcher those animals immediately.

DR. HENDERSHOTT: What precaution should a person take in handling radioactive animals?

MR. LANGHAM: The precautions that should be taken may be something as follows:

The first thing to do is to monitor the animal with a Geiger counter to see what the intensity of radiation is. If it approaches the level dangerous to a human, the safest thing to do is to give it distance, because radiation falls off as a function of the square of the distance you are from that animal. This means, don’t handle the animal if you possibly can avoid it.

If handling is deemed necessary, then one should do it with proper measuring devices so he will know when he is receiving a dangerous amount of radiation.

Also, if these are fission products, and if an individual is scrubbing an animal down with a brush, or something like that, one of our worries is whether or not radioactive particles pulled into the lung may not eventually expose a certain percentage of persons to cancer of the lung.

In handling anything which tends to create a radioactive dust we use very adequate masks to protect the worker.

VOICE: In washing down the animal should there be precaution taken concerning
the wash water? Fission products remain in the washwater and contaminate the soil, don't they?

MR. LANGHAM: That is one of the worst problems of the Atomic Energy Commission, handling of waste disposal. There are tolerances set up as to how radioactive waste may be before you can pour it down a sink. There are tolerances, and if radioactive waste is sufficiently contaminated that it cannot be discharged into open sewers, it then must be stored in underground tanks until it has decayed down to that tolerance limit.

You are correct in saying that the disposal of the washwater itself may create a problem. However, it has a dilution effect, and if you use enough water you will dilute the washing down enough so that probably it would go below the tolerances that are allowed to run down sewers and other disposal facilities.
REPORT OF THE DELEGATE TO THE NATIONAL BRUCELLOSIS COMMITTEE

R. W. SMITH, D.V.M., Concord, New Hampshire

Mr. Chairman and members of the convention and friends, please do not confuse the Brucellosis Committee and the National Brucellosis Committee. This is not a report of the Brucellosis Committee of this Association.

The National Brucellosis Committee had its birth in Washington March 15, 1949, when sixty-five representatives from all over the United States met there for the purpose of seeing what assistance could be rendered to the industry and the several states and the B.A.I. to eradicate brucellosis from our livestock.

I won't go into the details of the organization, but I will say that it has progressed to the point now that this last August the Committee was incorporated under the laws of the State of Illinois, a board of directors was formed and the several committees are at work.

Its purpose is to assist in every way possible to advance the eradication program. Funds are being raised from private industry and from interested organizations and all people who are interested in seeing this scourge of our livestock eradicated.

The list of representative organizations that are members at the present time are:

- American Farm Bureau Federation
- American Meat Institute
- American Medical Association
- American National Livestock Association
- American Public Health Association
- American Veterinary Medical Association
- Association of Land Grant Colleges and Universities
- Bureau of Animal Industry, U.S.D.A.
- The Dairy Industry Committee
- National Association of Swine Records
- National Beef Breeds Association
- National Cooperative Milk Producers Federation
- National Farmers Union
- National Grange
- National Livestock Loss Prevention Board
- National Livestock and Meat Board
- National Research Council
- National Wool Growers Association
- Purebred Dairy Cattle Association
- Texas and Southwestern Cattle Raisers Association
- United States Livestock Sanitary Association
- United States Public Health Service

I am reading this brochure, which was not for general distribution but was made up for the sole purpose of being used by our Finance Committee, for the purpose of raising the funds. Very briefly, this brochure gives the objectives of the Committee.
and I will touch on those that you will be interested in because I would take too much of your time if I went into detail.

The National Brucellosis Committee has been organized to eliminate the loss from brucellosis. It is to initiate a nationwide program to coordinate education, promotion and continued intensive research to put an end to brucellosis.

The Committee is composed of representatives of twenty-two organizations. The directors are:

- Clinton K. Tomson, National Beef Breeds Association
- J. F. Cavanaugh, Purebred Dairy Cattle Association
- W. D. Knox, Hoard's Dairyman
- S. H. McNutt, Association of Land Grant Colleges and Universities
- W. S. Moscrip, National Cooperative Milk Producers Federation
- R. C. Pollock, National Livestock and Meat Board
- R. W. Smith, United States Livestock Sanitary Association
- James H. Steele, United States Public Health Service
- Ray W. Willoughby, Texas and Southwestern Cattle Raisers Association

The primary function of the National Brucellosis Committee is as follows:

1. Education and Information:
   - Develop and distribute new educational materials.
   - Counsel with other agencies on their educational programs.
   - Be available to screen for authenticity radio and press releases on brucellosis.

2. Coordination and Promotion:
   - Assist in the development and administration of disease eradication programs.
   - Stimulate action and interest by working with livestock owners and others.
   - Counsel with the committees of the United States Livestock Sanitary Association in the development of control programs and interstate shipment regulations.

3. Research:
   - Correlate and stimulate research projects.
   - Interpret and evaluate public research findings.

There is an article here comparing brucellosis with tuberculosis, which we have practically licked. You may be interested to know this next item: "Contributions from interested organizations: The money must be raised from contributions by the processors of meat and dairy products, producers of meat and dairy products, press, radio, animal and human health organizations, and other interested persons. Expenditures will be under the direct supervision of the finance subcommittee with the approval of the Executive Committee. The only expenses will be salaries of the staff, general administration expenses, and materials and supplies. Neither salaries nor travel expenses for meetings will be paid to the representatives of the organizations that make up the National Brucellosis Committee."

Then they go on to tell how brucellosis can be stopped.

I believe I am correct in saying that it is their purpose to raise $250,000 over a five-year period; and when the money is in sight and the organization is perfected
in a little more detail, an administrative officer will be hired to carry out the policies as I have indicated them to you in this brochure and probably an assistant for him also will be hired.

Another thing that might be of interest to you is that you didn’t notice anything in here about legislation. In our first brief we had a legislative committee, at Columbus last year it was unanimously decided that that was a function of such organizations as are now in the field, including this Association, we therefore entirely eliminated the matters of legislation from the functions of this Committee.

I am the official delegate of this Association. I might say that all these men so far are very much interested. I have detected nothing in their natures or attitude that would indicate they want to take over the program and run it. They have one objective in mind, that is to see that the job is done and to assist anywhere and everywhere they can. I have every confidence that they are going to be a great help in the eradication of brucellosis in the United States.

At the meeting held in Chicago July 8, 1950 the following Committees were set up:

NATIONAL BRUCELLOSIS COMMITTEE
Permanent Subcommittees, July 8, 1950

Executive Committee

Clinton K. Tomson, Chairman
J. F. Cavanaugh          R. W. Smith
W. S. Moscrip            James H. Steele
S. H. McNutt             Ray W. Willoughby
R. C. Pollock            W. D. Knox

Subcommittee on Education and Information

R. C. Pollock, Chairman
Joel I. Connolly          C. D. Lowe
Milton R. Dunk            E. Robert Shannon
R. C. Klussendorf         Paul M. Visser

Subcommittee on Research

S. H. McNutt, Chairman
G. H. Hart                C. A. Manthei
L. M. Hutchings           W. W. Spink

Subcommittee on Procedures

J. F. Cavanaugh, Chairman
Herman Aaberg             A. K. Kuttler
T. F. Arnold              H. R. Smith
Dorsey Kirk

Subcommittee on Finance

James H. Steele, Chairman
H. R. Davison             Josiah J. Moore
Harold J. Harris          W. A. Wentworth
H. E. Kingman, Jr.
FACTORS INFLUENCING THE PROPERTIES OF DESICCATED BRUCELLA ABORTUS VACCINE

W. F. VERWEY, B.Sc., D.Sc., N. H. HARRINGTON, B.Sc., AND CLARA MATT

Sharp & Dohme, Incorporated, Glenolden, Pennsylvania

Five years have passed since Brucella vaccine desiccated by lyophilization was made available on a commercial scale and several years of research had gone by prior to that time.

I am indebted to Dr. O. E. Herl of the United States Bureau of Animal Industry for the figures used in the first chart showing the amount of Brucella abortus vaccine that was approved by the Bureau of Animal Industry for distribution from 1945 through 1949. The increasing use of the lyophilized vaccine that is demonstrated in this chart makes it appropriate to review some of the information that is available concerning its preparation and properties.

Since much of my discussion will pertain to the effect of various steps in the lyophilization process upon dried Brucella vaccine, it seems advisable for orientation purposes to review the current procedure for preparing the vaccine. The influence of various factors in the process upon the viability and stability of the vaccine will be discussed in the sequence in which these factors fit into the normal procedure.

Brucella abortus strain 19 is grown on the surface of potato-glycerine-agar, and then the organisms are washed off into M/20 phosphate buffer at pH 6.5. This suspension is adjusted by turbidimetric measurement to twice the density desired in the complete liquid vaccine and an equal quantity of skimmed milk is added. The vaccine then is placed in vials and quickly shell-frozen on the inside walls of the vials by revolving them in a mixture of carbon dioxide ice and alcohol at a temperature of approximately -70° C. After freezing, the vials are put into a vacuum chamber and desiccated from the frozen state under controlled conditions of temperature and pressure. After a suitable period of desiccation, they are removed from the vacuum chamber and then re-evacuated and sealed by equipment especially designed for this purpose.

Our work has been directed toward determining the effects of various factors in the lyophilization process upon the viability and stability of the material and toward determining the physiologic and bacteriologic properties of the vaccine. Since the number of viable organisms in the vaccine is the only easily accomplished presumptive measurement of its probable antigenicity, conclusions are based on the counts of viable bacteria that are obtained under various circumstances.

The development of a suitable suspending and stabilizing menstruum that would protect the organisms from destruction during lyophilization was a problem of first importance. Several different suspending fluids have been tried and the results with most of them were presented before the Association several years ago. A resume is shown in the next table. The skimmed milk-phosphate buffer solution, in our hands, at least, has been the most generally satisfactory since it permits the recovery of about 40 per cent of the originally viable cells and vaccines prepared in this mixture have good stability. Suspending agents and lyophilization conditions can be used that produce a higher percentage of viable organisms immediately after desiccation.
cation, but these procedures have resulted in relatively rapid loss of viability during storage. In the practical use of strain 19 vaccine, the percentage of organisms originally present that are killed during lyophilization is of secondary importance since it should be emphasized that the product is required to meet viability standards after all processing losses have taken place. On the other hand, loss of viability after final testing occurring during storage and field handling may have a direct

Fig. 1.—Brucella Abortus vaccine produced in licensed Establishments years 1945-1949.

**Table I**

Effects of Suspending Solutions on the Recovery of Viable Brucella Abortus after Lyophilization

<table>
<thead>
<tr>
<th>SUSPENDING SOLUTION</th>
<th>PERCENTAGE OF ORIGINAL COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Hydrogen Phosphate M/20</td>
<td>21</td>
</tr>
<tr>
<td>Gelatin 1.0%</td>
<td>8</td>
</tr>
<tr>
<td>Bovine Serum 20 per cent</td>
<td>25</td>
</tr>
<tr>
<td>Skimmed Milk-phosphate</td>
<td>44</td>
</tr>
</tbody>
</table>

effect upon the immunizing capacity of the administered dose. It is this lack of stability that has been a major problem with the liquid vaccine.

Lyophilization can be considered as consisting of three distinct steps; first, the freezing, then the desiccation from the frozen state under vacuum and then the sealing of the containers. The three steps have been studied separately.

The results of individual experiments carried out to determine the effect of freezing at \(-70^\circ C\) upon bacterial viability have been variable, but an analysis of 100 consecutive production lots indicates that there is a loss of only about 10 per cent of the viable organisms in this procedure.
The next step in the lyophilization process is the sublimation of water from the frozen vaccine under reduced pressure. This is the most critical step in the process and is the point of major loss of viability if conditions are not properly selected. Losses as high as 96 per cent and as low as 10 per cent have been obtained by varying the conditions of this step. Since the desiccation process is directly affected in a highly complex manner by a number of variable factors, it is almost impossible to define conditions for optimal desiccation in terms that may be translated from one design of equipment to another. However, by working with the same piece of equipment and keeping most conditions constant, it has been possible to study the effects of variations in pressure and processing time.

Usual lyophilization practice employs residual pressures around 50 to 100 microns and such low pressures have been very satisfactory for normal human plasma, complement, and penicillin. It has been found that these pressures and the conditions of temperature that they produce are destructive for *Brucella abortus*. This is accentuated by long periods of processing and is illustrated in Table II where the viability percentages of two experiments are given. It can be seen that high pressure i.e., poor vacuum and standard time of processing produced 47 per cent and 33 per cent survivals while low pressure and long time permitted survival of only 7 per cent and 4 per cent of the originally viable bacteria.

A study was also made of 100 consecutive lots of vaccine in an attempt to correlate the residual moisture present immediately after lyophilization with the percentage recovery of viable organisms. Over the moisture content range of 1.2 per cent to less than 0.1 per cent there was no correlation whatsoever. It would appear, therefore, that moisture within this range has little to do with the number of organisms that survive. As will be mentioned later, however, the same cannot be said for the role of moisture in the stability of the vaccine under storage conditions.

Although the factors mentioned so far are concerned with the recovery of viable *Brucella* organisms, the major problem with *Brucella* strain 19 vaccine has been its stability under field conditions of transportation, storage and use. Studies have been made to evaluate the stability of the desiccated vaccine and to determine some of the factors that affect stability.

One of the points examined was the relationship between the moisture content immediately after lyophilization and the stability of the vaccine under conditions of storage. It has been difficult for various reasons to assemble any extensive series of figures bearing on this point, but from experience with a limited number of lots.

### Table II

<table>
<thead>
<tr>
<th>Residual Pressure</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment 1</td>
<td>47</td>
<td>36</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>33</td>
<td>23</td>
</tr>
<tr>
<td>Average</td>
<td>40</td>
<td>29.5</td>
</tr>
</tbody>
</table>

**The Effect of Residual Pressure and Processing Time on Viability Percentage in Lyophilized *Brucella Abortus* Vaccine**
it is clear that there is a distinct relationship between high initial moisture content and poor stability. A vaccine having a moisture content of 1.5 per cent or more is quite likely to be unstable. Other results indicate that moisture from any source, whether initially present or subsequently accumulated during storage, is deleterious to vaccine stability. This was demonstrated by a study that compared storage in glass sealed vials and in rubber sealed vials having aluminum caps. In this experiment, a single lot of vaccine was distributed into the two types of containers mentioned and after lyophilization and sealing under vacuum, the containers were stored at 5° C, room temperature, and 37° C. Periodic determinations of moisture and viable count were carried out and illustrative results at 9 months and 30 months are given in Table III. The number of viable bacteria at the start of the storage

**Table III**

*A Comparison of the Stability of Lyophilized Brucella Abortus Vaccine in Glass Sealed Vials and Rubber Sealed Vials*

<table>
<thead>
<tr>
<th>Storage Temp.</th>
<th>Glass Sealed Vials</th>
<th>Rubber Sealed Vials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-5° C</td>
<td>Room T.</td>
</tr>
<tr>
<td>Pre-storage</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Stored 9 Months</td>
<td>119</td>
<td>103</td>
</tr>
<tr>
<td>Stored 30 Months</td>
<td>86</td>
<td>49</td>
</tr>
</tbody>
</table>

**Percentage Moisture in Vaccine**

<table>
<thead>
<tr>
<th>Storage Temp.</th>
<th>Glass Sealed Vials</th>
<th>Rubber Sealed Vials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-5° C</td>
<td>37° C</td>
</tr>
<tr>
<td>Pre-storage</td>
<td>0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Stored 9 Months</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Stored 30 Months</td>
<td>0.7</td>
<td>0.8</td>
</tr>
</tbody>
</table>

period was designated as 100 per cent. It can be seen that there is a gradual accumulation of moisture in the material in the rubber sealed container, whereas there is, of course, little, if any, in the all-glass vial. This change in the rubber sealed vial is slight at 5° C but is considerable at 37° C. Also, although there is a decrease in viability with time and higher temperatures even in the all-glass container, this is much more marked in the rubber sealed vials that are absorbing moisture. Although the all-glass container provides better conditions for vaccine stability, unfortunately, it has been found to be more inconvenient and more costly to use. Therefore, lyophilized vaccine is now supplied universally in the rubber sealed container. The vaccine in rubber sealed vials, though not as stable as in the glass-sealed vials, is still very good. It will be noted that this vaccine exceeded Bureau of Animal Industry viability requirements even after 2½ years of storage at 2°–5° C and still had 30 per cent of its pre-storage count after nine months at room temperature.

In continuing the discussion of the stability of lyophilized *Brucella abortus* vaccine, we felt that it might be of interest to examine records of actual production lots
that had been tested for viability at various periods after their preparation. These figures do not represent planned stability tests (such information has been published previously1 2) but rather, these tests were carried out at irregular times for a variety of reasons. A total of 36 production lots have been tested and of 13 tests that were carried out within the dating period of the vaccine, all indicated viability above the Bureau of Animal Industry's standards. Of 27 tests carried out between 12 and 25 months after the preparation of the vaccine, 19 were above standard and 8 were below. From these figures it would appear that on storage at refrigerator temperatures the vaccine is uniformly satisfactory within its dating period and the majority of lots would meet the requirements of the Bureau of Animal Industry for at least two years. These results are in confirmation of previously published stability tests. Comparatively few samples of production lots of vaccine have been stored at higher temperatures, but the results that are available would indicate that the vaccine can withstand at least 3 months at room temperature and 6 weeks at 37°C. Tests at still higher temperatures have not been carried out with the rubber sealed containers, but previous results with the glass sealed ampules demonstrated that the vaccine could withstand temperatures of 50°C for at least two days and it is believed that the rubber-sealed containers would behave in a similar manner during such short exposure periods.

It should be emphasized that all of these stability figures have been obtained using containers that have been sealed under vacuum. The elimination of air constituents (presumably oxygen) is absolutely necessary for long term stability. In fact, vaccine in containers that do not have a strong vacuum should not be used.

The fact that lyophilized Brucella abortus vaccine may be stable beyond its dating period and that it is capable of withstanding exposure to higher temperatures should not be taken as an invitation to abuse it. It is our opinion that every effort should be made to maintain the vaccine under the recommended conditions of refrigeration during transportation and storage, but if this cannot be done, the viability of the vaccine will not decrease rapidly. Lyophilized Brucella abortus vaccine in the rubber sealed container has a stability which should be adequate to meet almost any unavoidably poor conditions of transportation or temporary storage. However, the data demonstrate clearly that continuous storage at high temperatures should be avoided.

There is another very important question concerning the stability of the lyophilized vaccine that has been investigate. This concerns the vitality of the viable cells after restoration from the desiccated state. Samples of two production lots of lyophilized vaccine after refrigerated storage in the dry state for 3 months were restored to the liquid state and held at refrigerator temperatures for 90 days. At various intervals during this period, viable counts were made to determine the rate at which the organisms died. Table IV illustrates the results that were obtained.

It can be seen that there is no rapid decrease in viable count upon restoration and the vaccine met the stability requirements for fresh liquid vaccine. We believe that these figures give good evidence that lyophilization does not cause serious physiologic damage to the organisms that survive the desiccation process. The data suggest further the possibility that if suitable conditions for transportation are available, the lyophilized vaccine could be restored in the office of a veterinarian.
where aseptic conditions are more easily attained and then transported to its point of use in the liquid state. Such a procedure reduces the bulk of the package that must be transported and permits the more rapid accomplishment of field immunization.

One further type of study that should be mentioned has been carried out. The work of Braun has indicated that the rough non-antigenic variant of Brucella abortus strain 19 survives lyophilization better than does the smooth antigenic form. Therefore, the lyophilization of a mixed suspension of smooth and rough organisms would have a tendency to increase the proportion of rough cells in the viable bacterial population. Nine lots of lyophilized vaccine were plated out and 100–200 colonies of each lot were examined according to the method of Henry. In seven of these lots no rough colonies whatsoever were seen. In the other 2 samples, one rough colony was seen in each instance. These observations demonstrate that the selection of rough variants by lyophilization is not a significant factor in the vaccine as it is prepared currently.

**DISCUSSION**

The results of the studies that have been summarized here indicate that the lyophilized Brucella abortus vaccine has a stability very considerably better than the liquid type vaccine. At the present time all of the vaccine supplied in this country is in single dose containers. Where a large number of animals are to be immunized this makes it somewhat inconvenient in the field. The objections to supplying Brucella abortus vaccine in a multiple does container apparently have been based on doubts concerning the stability of vaccine that has been restored to the liquid state and on fears that contaminating organisms would be able to multiply in the containers if a period of time elapsed between the initial and the final use of the material. The data that have been presented on the stability of restored vaccine seems sufficient to remove doubts concerning stability. A consideration of the fundamental requirements for bacterial multiplication suggests that serious over-growth of contaminants is not likely to occur within a few days unless the vaccine is held at room temperature or above. Such treatment is so far out of the range of recommended

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**Table IV**

**Viability of Desiccated Brucella Abortus Vaccine During Storage at 2 to 5° C. After Restoration**

<table>
<thead>
<tr>
<th>Storage Time (Days)</th>
<th>Lot 1.</th>
<th>Lot 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>96</td>
<td>102</td>
</tr>
<tr>
<td>14</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>21</td>
<td>97</td>
<td>107</td>
</tr>
<tr>
<td>28</td>
<td>96</td>
<td>90</td>
</tr>
<tr>
<td>36</td>
<td>100</td>
<td>99</td>
</tr>
<tr>
<td>90</td>
<td>68</td>
<td>75</td>
</tr>
</tbody>
</table>

...
practice that it would constitute a definite abuse of this product. Therefore, it seems to us that the many who would use the multiple does container correctly should not be deprived of its advantages because of the few who would abuse it. Fairly extensive, full scale production experience makes it clear that it is entirely practical to prepare Brucella vaccine in multiple dose containers and that there is considerably economy in the use of this procedure.

**SUMMARY**

The observations here summarized have been directed toward the study of factors affecting the viability of organisms during the processing of *Brucella abortus* vaccine and influencing the stability of the desiccated product. It would appear that, although there is little loss in viability on freezing, the desiccation step is critical in determining the number of organisms that survive the lyophilization process. The use of relatively high residual pressures and a relatively short period for desiccation together with a suitable suspending medium such as a phosphate buffer-skimmed milk mixture permits about a 40 per cent recovery of the original number of viable cells and provides very good stability. It was found that stability during storage and resistance to adverse conditions of temperature were determined largely by opportunities for interaction of air constituents and moisture with the lyophilized product. Therefore, the selection and sealing of containers are probably the most important factors influencing the long term stability of the vaccine. It has been found that organisms surviving the lyophilization process have not sustained any serious physiologic damage and have maintained their viability when restored to the liquid state as well as organisms in fresh liquid vaccine. Finally, it has been demonstrated that the lyophilized vaccine does not contain a significant proportion of the rough, non-antigenic variant. On the basis of these observations, suggestions have been made for facilitating the use of the desiccated vaccine in the field without impairment of its effectiveness.

**BIBLIOGRAPHY**

REPORT OF THE SIX STATE EXPERIMENT BRUCELLA “M” VACCINE

T. C. GREEN, D.V.M.

Charleston, West Virginia

On presenting this report, it is deemed fitting and proper that we should at this time recognize those who have made the experiment possible. They were:

- Dr. I. Forest Huddleston, Research Professor in Bacteriology, Michigan State College, who first developed Brucella M Vaccine.
- Mr. R. J. Funkhouser, Industrialist and Farmer, Ranson, W. Va., who in addition to furnishing a farm and necessary facilities, underwrote the experiment in the sum of $20,000.

We wish to also recognize the late Dr. H. C. Givens, State Veterinarian, Richmond, Virginia, who contributed much of his time and energy toward promoting the experiment.

There are many others who contributed of their time and energy toward conducting the experiment that space will not permit mentioning at this time.

Data obtained in a cooperative project involving personnel from six States, Maryland, New Jersey, Ohio, Pennsylvania, Virginia and West Virginia, furnish the basis of this report. A detailed report of this work is being published and consideration at this time will cover only those phases that appear to be pertinent to the objective of the present presentation.

The primary objective of this test was to ascertain the protective value of the mucoid vaccine administered to brucella negative heifers that were later experimentally exposed to a virulent strain of Br. abortus during their first gestation.

It would serve no worth while purpose to review at this time the early efforts aimed at the development of a protective vaccine against bovine brucellosis, other than to state that no note-worthy success in the use of agents incapable of producing infection of the vaccinate was attained prior to the development of Strain 19 vaccine by the United States Bureau of Animal Industry.

The principal handicap to the use of this vaccine, especially when administered to adult animals, is the development of blood agglutinin titers that may persist over protracted periods and which cannot be satisfactorily distinguished from those that develop following actual brucella infection of the cattle.

Huddleston in 1947 (1) reported that when numbers of live brucella organisms in the phase of growth designated as the Mucoid were injected into guinea pigs these animals failed to develop a progressive type of disease and when the mucoid strain was used as a vaccine it produced a high degree of resistance against experimental exposure with virulent brucella organisms.

Extending the use of the vaccine to cattle Huddleston in 1948 (2) reported the results of its use in 24 herds in the majority of which Brucella infection was of recent development. Non-vaccinated animals were not available for use as experimental controls in these herds and the protective value of the vaccine was based upon what
might be the expected spread of infection as has been commonly experienced in non-vaccinated herds having a similar exposure history.

Results obtained gave evidence on the value of the mucoid vaccine as a method for producing a serviceable degree of resistance to the majority of the vaccinates under the brucella exposure that existed in these herds.

These investigations engage not only the attention of workers in this field of research but also a rather enthusiastic demand by many herd owners for use of the Mucoid vaccine in their animals. These interests stimulated initiation of the present test in which both Mucoid vaccinated and non-vaccinated cattle would be subjected to direct experimental exposure with virulent Br. abortus organisms.

The present experiment was originally designed to include three groups of animals each to contain 20 young, unbred, brucellosis free heifers. One of these groups was to be given Mucoid vaccine prior to breeding; one to be vaccine treated after pregnancies had been established; and one to be used as non-vaccinated controls. All animals were to be subjected to experimental brucella exposure after gestations of desirable duration had been attained.

The breeding program for these heifers was to be restricted to 65 days duration in an attempt to have pregnancies of rather uniform duration and thus to allow brucella exposure of all groups at the same time. However, even though the breeding period was extended an additional 71 days, only 30 of the heifers were found to be pregnant upon clinical examination made just prior to the time for exposure.

Sixteen (16) of the pregnant heifers had received vaccine prior to breeding and the remaining 14 were non-vaccinates.

As a result of the limited number of heifers that became pregnant and the similarity of number in the vaccinated and non-vaccinated groups, it was deemed advisable to revise the plan of the test and omit any attempt to include a group of heifers vaccinated following the establishment of pregnancy, as had been originally intended.

The heifers ranged from 1½ to two years in age at the time of their selection for the experiment.

Freedom from brucella infection of these heifers both at the time of their selection and during the period of approximately ten months prior to their experimental challenge, finds support in the negative agglutination tests shown by each of these animals made at intervals during this period of time.

The heifers were held as a single unit which afforded opportunity for intermingling of the animals. No attempt was made to segregate the heifers or their calves at any time during the experiment and no sanitary measures were used to reduce the opportunity of brucella re-exposure following the challenging test.

The farm upon which this experiment was conducted is located near Charles Town, West Virginia, in an area of limited highway travel and on which other cattle had not been quartered for the past year or more. The basement area of a large bank barn having an adjacent enclosed exercise lot was used for feeding and protection of the animals during the winter months and as overnight quarters during the grazing season. No other domestic animals were on this farm throughout the period of the test. Entrance to the premises was restricted to the personnel required
to maintain the herd and conduct the project. General supervision of the herd was maintained by a veterinarian stationed at the farm.

Huddleston's Brucella Mucoid vaccine serial M-31 used in this test was supplied by the Brucella Laboratory, Michigan State College, East Lansing. The recommended dose for this serial of vaccine was 1.5 ml. per animal and was injected subcutaneously in the dorsal posterior scapular region on July 7, 1948, 7 months prior to brucella exposure.

Following vaccine administration to the time of experimental brucella exposure no evidence of agglutinin development was noted in the tests of any of the vaccinates except one (heifer #12). This animal showed complete agglutination in the 1:25 dilution in a single test made six months after vaccination.

The strain of *Br. abortus* to use as well as the number of viable cells that would afford a suitable experimental challenge in this test, presented a problem of major concern.

Review of literature failed to afford a consensus in answer to this problem. However, it is rather generally conceded that the number of organisms of the exposure dose is inversely related to the infectivity of the culture used and that vaccinal resistance may be entirely overcome by sufficiently severe brucella exposure. However, one of insufficient infectivity would fail to show a significant rate of infection in control animals.

The results of investigations cited in the 1948 Report of the Chief of the Bureau of Animal Industry (3), Research Administration appeared pertinent to this question of experimental infection dosage.

In those tests heifers vaccinated with Strain 19 were exposed during their first gestation to different numbers of cells of a virulent culture of *Br. abortus*.

One group of these heifers was given an exposure dose of 15 million organisms; a second group 741 thousand and a third group 370 thousand. Similar exposure dosages were given to non-vaccinated control groups.

These exposures resulted in an infection rate in the control groups of 100%, 88.8% and 77.7% in the high, intermediate and low exposure doses respectively, whereas the vaccinated groups showed infection in 72.7%, 22.2% and 0.0% of the heifers under an exposure dosage similar to that of the controls.

These results emphasize that resistance to brucellosis induced by a vaccine can be overwhelmed by a sufficient exposure dosage and indicate the need of having a thorough knowledge of the virulence and amount of brucella exposure material to be used for the accurate evaluation of vaccinal resistance.

The organism selected for challenge in the present test was supplied through the courtesy of the United States Bureau of Animal Industry and was designated as *Br. abortus* #2308. This strain of brucella has been used by different investigators for exposure tests in cattle and is one for which information was available regarding its virulence and the number of cells considered suitable to challenge vaccinal resistance.

The exposure dose used was 1 million viable cells administered by lachrymal sac instillation, one half of the amount being deposited in each eye. This challenge was made approximately 9 months following vaccine administration. The majority of
the heifers were in the latter half of the 6th month or early part of the 7th month of
gestation at the time of experimental exposure.

Attempts to recover *Br. abortus* from material collected at the time of calving
were made by cultural and guinea pig inoculations of spleen, liver, lung and stomach
content samples obtained from the aborted fetuses and from colostral milk of each
dam.

Additional milk samples collected from the heifers usually at approximately
weekly intervals following calving, were tested from brucella organisms by the cul-
ture method only. Collection of these milk samples covered an interval of 5½
months. However, the total number of tests for the individual heifer varied some-
what depending upon her date of calving.

In an attempt to evaluate the results of this experiment the data are considered
under four different headings, viz:—

1) Agglutinin response following experimental exposure; 2) The outcome of ges-
tation; 3) The recovery of *Br. abortus* from materials obtained at or near the time
of calving, and 4) The recovery of *Br. abortus* from milk samples collected at inter-
vals following calving.

The data of the individual animals obtained in this experiment are too numerous
for detailed consideration at the present time. However, a summary of the results
are given in table I to which you are referred.

The heifers were classified as non-reactors or reactors on the basis of blood ag-
glutination tests made at intervals over a period of 248 days following experimental
exposure.

Those showing consistent titers of complete agglutination at 1:100 or higher di-
lutions were classed as reactors and those showing titers consistently lower were
classed as non-reactors.

Using this basis of grading, three of the 16 vaccinated and one of the 14 non-
vaccinated heifers failed to become infected as a result of their brucella exposure.

On the basis of the outcome of gestation there were 9 normal, 3 premature and 4
abortion calvings in the vaccinated group, as compared to 4 normal, 2 premature
and 8 abortion calvings in the control group.

The results of recovery of *Br. abortus* from material collected at or near the time
of calving showed 8 positive recoveries from the 16 vaccinates and 10 from the 14
non-vaccinates.

In tabulation of the results of attempted recovery of *Br. abortus* from quarter
milk samples collected at intervals following calving, the test was considered posi-
tive if brucella were recovered from either of the quarters sampled.

On this basis only 2 of the 16 vaccinates and 1 of the 12 non-vaccinates gave
consistently positive recoveries in each test. None of the heifers in either group
showed consistently negative tests.

Reduced to a percentage basis the data presented in Table I show the following
relationships.

Of the 16 "M" vaccinates 56.2% had normal calvings while the 14 non-vaccinated
had 28.5 normal calvings, or a percentage difference of 27.7% in favor of the vac-
cinates.
Of the vaccinates 18.8% showed non-reactor agglutinin titers following their exposure challenge as compared to 7.1% in the control group, a difference of 11.7% in favor of the vaccinates.

### Table I. Summary of Results Based on:

<table>
<thead>
<tr>
<th>&quot;m&quot; Vaccinates</th>
<th>Agglutinin Titors</th>
<th>Outcome Gestation</th>
<th>Br. Ab. at Calving</th>
<th>Br. Ab. in Milk Post Calving</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Nor.</td>
<td>Pr.</td>
<td>Abt.</td>
</tr>
<tr>
<td>1</td>
<td>R</td>
<td>A</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>N</td>
<td>Pr.</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>R</td>
<td>N</td>
<td>Pr.</td>
<td>+</td>
</tr>
<tr>
<td>12</td>
<td>Non-R</td>
<td>N</td>
<td>Pr.</td>
<td>+</td>
</tr>
<tr>
<td>15</td>
<td>R</td>
<td>Pr.</td>
<td>+</td>
<td>12</td>
</tr>
<tr>
<td>18</td>
<td>R</td>
<td>N</td>
<td>+</td>
<td>7</td>
</tr>
<tr>
<td>21</td>
<td>Non-R</td>
<td>N</td>
<td>+</td>
<td>3</td>
</tr>
<tr>
<td>39</td>
<td>R</td>
<td>N</td>
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</tr>
<tr>
<td>49</td>
<td>R</td>
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<td>+</td>
<td>8</td>
</tr>
<tr>
<td>50</td>
<td>R</td>
<td>N</td>
<td>+</td>
<td>4</td>
</tr>
<tr>
<td>51</td>
<td>Non-R</td>
<td>N</td>
<td>Pr.</td>
<td>+</td>
</tr>
<tr>
<td>52</td>
<td>R</td>
<td>N</td>
<td>Pr.</td>
<td>+</td>
</tr>
<tr>
<td>55</td>
<td>R</td>
<td>A</td>
<td>+</td>
<td>9</td>
</tr>
<tr>
<td>59</td>
<td>R</td>
<td>N</td>
<td>+</td>
<td>4</td>
</tr>
<tr>
<td>62</td>
<td>R</td>
<td>A</td>
<td>+</td>
<td>11</td>
</tr>
<tr>
<td>63</td>
<td>R</td>
<td>Pr.</td>
<td>+</td>
<td>6</td>
</tr>
</tbody>
</table>

**Non-Vaccinates**

|                |                   | Nor. | Pr. | Abt. | Yes | No. | Pos | Neg |
|                |                   | A    | +   | -    | 8   | 3   |
| 9              | R                 | A    | +   | 5   | 1   |
| 10             | R                 | Pr.  | +   | 8   | 2   |
| 11             | R                 | A    | +   | 11  | 2   |
| 20             | R                 | A    | +   | Dry |
| 25             | R                 | A    | +   | 11  | 0   |
| 26             | R                 | A    | +   | 8   | 3   |
| 27             | R                 | Pr.  | +   | 1   | 10  |
| 43             | Non-R             | N    | -   | 2   | 2   |
| 46             | R                 | N    | -   | 3   | 5   |
| 53             | R                 | N    | -   | 7   | 5   |
| 56             | R                 | A    | +   | 0   | 1   |
| 61             | R                 | A    | +   | 8   | 4   |
| 65             | R                 | N    | +   | 6   | 5   |

Br. abortus was not recovered from material examined at calving in 50.0% of the vaccinates and in 28.5% of the non-vaccinates, a difference of 21.5% in favor of the vaccinated group.

Br. abortus was recovered from milk samples collected following calving in 100% of each group.

The results obtained by either the agglutination test, the outcome of gestation, or the recovery of brucella from material collected at parturition, which have been
the more common methods formerly used to determine the value of brucella vac-
cine, show a noticeable percentage difference between the vaccinated and non-
vaccinated groups, the trend being consistently in favor of the vaccinated heifers.

However, if the recovery of brucella from the milk in any of the series of post
parturition milk collections is considered to indicate infection of the animal, then
no protective value can be attributed to the vaccine as used under the conditions of
this investigation.

SUMMARY

Data are presented which were obtained in a test of the protective value of Hud-
dleson's Mucoid vaccine involving the use of 14-non-vaccinated and 16 vaccinated
heifers, with Br. abortus challenge 9 months following vaccine administration.

The challenge was made by conjunctival sac instillation of 1,000,000 viable, Br.
abortus strain #2308 organisms per animal. It is recognized that the severity of
this challenge may have been such as to overcome the degree of resistance which
any presently known brucella vaccine might produce.

There was no evidence of any agglutinin development following vaccine admin-
istration that would interfere with the agglutination test as a diagnostic agent for
brucellosis in cattle.

Four methods were used in attempting to determine the value of vaccination,
viz: 1) agglutinin response following exposure, 2) outcome of gestations, 3) recovery
of Br. abortus from specimen material collected shortly after calving, and 4) recovery
of brucella organisms from milk samples collected at intervals following termina-
tion of gestation.

Consideration of the data on a percentage basis showed a difference in favor of
the vaccinated heifers of 27.7% in normal calvings, 11.7% in non-reactor agglutinin
titers and 21.5% in negative recovery of brucella at the time of calving. Whereas
each of the vaccinated and non-vaccinated heifers showed the presence of brucella
recovery in her milk in at least one of the collections made at different intervals
following parturition.

It is generally recognized that no brucella vaccine at present available will pro-
duce an absolute immunity against severe experimental exposure.

It therefore appears that definite conclusion as to the possible value of "M"
vaccine cannot be formulated from the limited data of the present test.

REFERENCES

1. HUDDLESON, I. FOREST: The Immunization of Guinea Pigs with Mucoid Phases of

2. HUDDLESON, I. FOREST AND G. R. BENNETT: The Vaccinal Immunizing Value of a

3. Report of the Chief of the Bureau of Animal Industry Agricultural Research Ad-
REPORT ON BRUCELLOSIS ERADICATION PROJECT

Asa Winter, D.V.M.¹

Even though the thinking of some individuals and a few groups, is still directed along the lines of brucellosis control only and with the least inconvenience, there has been an obvious trend during the past year with the cattle industry and the majority of state officials toward advancing action which will lead to eventual eradication of this disease. It is agreed that the approach adopted, if within the limits of recommended practices, is of little matter so long as the goal remains fixed. I am sure the members of this Association will be pleased to know that sentiment is crystallizing in favor of those recommended procedures, which offer assurance of constant reduction and eventual eradication of brucella infection, as a hazard to the economy of the livestock industry and the health of man. There are several factors which have served to strengthen earlier wavering attitudes and which will continue to encourage progress toward total eradication.

EFFECT OF THE UNIFORM PROGRAM

The recommendations of this Association, which recognize flexibility of practices in developing state programs of control and eradication, have impressed the livestock industry with the Association's interest in the problem of the individual breeder. The criticism which formerly existed with respect to a single practice has been eliminated and the best integration of plans for different areas is fast becoming a fact. There is the fortunate sequence that good progress is being made where practices in line with these recommendations are followed. As a result of the present approach to the brucellosis eradication problem there is stimulated interest in the program and more intensive action on the part of cattle owners and regulatory officials alike.

AID BY EDUCATIONAL AND SCIENTIFIC GROUPS

The regional brucellosis conferences, where all groups have listened to free expression by representatives of the industry and other interested agencies, have helped to unify thinking and stimulate constructive action. The assistance given by the Extension Service in sponsoring these conferences, together with the follow-up in each state on educational and promotional phases of the program have already demonstrated the effect of this service. Continued support of this type is vital to the development of the program.

As recommended at the time the National Brucellosis Committee was organized, local associated state and county committees have now been set up in several states. In one of the states county committees were organized first, with one member from each delegated for membership in the state committee. A state committee constituted in this manner should provide the type of membership which will be truly

¹ Dr. Winter is Assistant in Charge of the Brucellosis and Tuberculosis Eradication Division, Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.
representative of all state interests in its recommendations for advancing the brucellosis program.

Report No. 1 of the “National Research Council Committee on Public Health Aspects of Brucellosis” accepts the recommendations of the United States Livestock Sanitary Association as a national plan for control and eradication of bovine brucellosis and submits basic information regarding the disease and practices for its control. Support by this committee, which is composed of outstanding medical and veterinary researchers and headed by Dr. W. W. Spink, one of the most widely recognized authorities in the field, leaves little to be challenged on the accepted effectiveness of brucellosis eradication practices now in operation.

THE A.B.R. (Milk Ring) TEST

The Bureau is supplying a uniform antigen for furthering field research in the use of this test, with several states exploring its value under local conditions. Herds reported suspicious or positive to the A.B.R. test are being followed up with the blood agglutination test and the results studied comparatively for purposes of evaluation. These field studies continue to confirm the value of the A.B.R. test as an economical aid in detecting herd infection. A test such as this, which can be used for herd screening purposes, is badly needed if the brucellosis eradication program is to be advanced and certified areas maintained in view of veterinary manpower requirements for this work.

ADDITIONAL FIELD RESEARCH WITH STRAIN 19

Because of the increased commercial production of Strain 19 vaccine and the resulting demand on Bureau facilities to meet the thorough examination requirements for its distribution, Bureau production of this product has been limited to use only in herds where full data can be obtained on (1) the constancy of its immunizing properties, (2) the respective merits of subcutaneous and intradermic vaccination and relative persistence of the induced blood agglutination titers, (3) adult vaccination and (4) revaccination of animals originally vaccinated as calves. It is expected that information obtained from use in this manner will provide answers to some of the questions not fully covered in the results of the field experiment concluded in 1941 and will also add to our knowledge regarding the continuing stability of Strain 19 culture.

COMMUNITY AUCTION MARKETS

The control which will need to be exercised over the movement of brucellosis reactors, or animals with unknown status, if an eradication program is to be successful, should follow the animal from the farm through whatever channel of trade it may move.

The community sale which appears otherwise a valuable growing American institution, is if uncontrolled, one of our most potent means for dissemination of animal disease.

In the interest of brucellosis eradication, all interested agencies should lend support to any legislation designed to regulate the operation of these markets.
BLOOD TESTING AND CALF VACCINATION

This is the fourth consecutive year in which a decline in the per cent of brucella infection has been reported. During the 12 months ending June 30, 1950, there was the gratifying combination of an increased volume of testing and also a drop in reported reactors from the four per cent of the previous year to 3.5 per cent for this period.

The interest in calf vaccination continued to grow, with 2,065,063 calves reported as officially vaccinated during the year. This number represents a 31 per cent increase over the previous similar period. The increasing volume of calf vaccination is building constantly the number of animals with added resistance against brucellosis and must be given a prominent place when weighing factors responsible for the steady decline of this disease as revealed by the results of the brucellosis testing program.

AREA TESTING

While provisions of the uniform brucellosis program recognize wide variation in practices, we should continually bear in mind the necessity for eventual area testing with removal for slaughter of natural reactors and control of the infected herd, if the accepted goal of eradication is to become a reality.

All plans proposed by this Association are adaptable under certain conditions and regulatory officials are entrusted with the fair appraisal of each for adoption by that segment of the industry for which they may be responsible. There is the added responsibility, however, to also guide the industry and shape each program so that area eradication can be undertaken at such a time as may be consistent with local conditions.

SUMMARY

The time factor for advancement of the brucellosis eradication program is no longer on our side. The general public urge and public health requirements are giving the orders. Five years may seem like ample time but the regulatory officials and producers in a milk area where that deadline has been set by the health officials appreciate that rapid action will be necessary. Such disagreement as still exists regarding procedures is so minor there should be no delay in extending practices which will advance our respective states toward eradication of this disease.

Additional or modifying state legislation will in some instances be necessary in order to extend uniform practices and finally complete the job. A valuable guide for this purpose is the suggested Brucellosis Control and Eradication Act proposed by the Council of State Governments and made available to each state. Given the proper educational promotion and legislative support where it may be necessary for protection of the cooperating majority, the measures at our disposal can make brucellosis eradication an accomplishment and a paying investment.
Mr. Chairman and gentlemen, I have been asked to tell you a bit about the experiences we have had in Denmark for some years concerning brucellosis in the bovine male in relation to artificial insemination.

As I think most of you know, many years ago a lot of investigations were made on brucellosis in bulls. Investigations in this country as well as in my own country showed, especially around the 1920s, that bulls should not be dangerous to use even if they were infected with brucellosis, unless the cows were from non-infected herds. This statement was generally accepted also in Denmark and the cattle breeders up to that time really didn’t take care of their bulls. They were used as freely as possible and we didn’t think they were able to infect cows.

In Denmark we have not been able to demonstrate exactly positive cases of infections from bulls to cows in connection with breeding. That is a negative statement. Here and there practitioners protested against it and sometimes thought there was infection; but in the last part of the 1930s invention of artificial insemination was carried out in Denmark and when that went on the practice was not altered and bulls were used as freely as before. No one thought there would be any danger from that procedure.

In the summer of 1942 the chairman of one of our breeding associations for artificial insemination asked if it would be dangerous to use a bull which a few weeks earlier had had altered sperm and which, together with a number of other bulls, was on a farm, on which in the preceding months there had been quite a number of critical cases of abortion.

Well, according to practice, one should say there would be no danger; but luckily an investigation was made of that bull. The veterinarian was asked to send in samples of sperm. We got clean sperm samples, packed in crushed ice, so there was no possibility of secondary bacterial infection.

To our surprise, the plates from that sperm sample were very heavily covered with confluence colonies of typical brucella bacteria. This bull was also excreting brucella bacteria in its sperm in very heavy concentration. Of course, the bull was isolated, and later on it was slaughtered.

Some months later an investigation was carried on in the area where the sperm of that bull had been used. Blood investigations of all the herds were made in which that sperm had been used. We were lucky in that more than half of the animals in which the sperm had been used were maintained on an island which we had cleared of brucellosis. We call it our area plan. We are trying to eradicate brucellosis in Denmark. It is a problem for us in our country, as it is for you here.

On this island we had a number of investigations made of the herds, and we knew exactly that they had been free of brucellosis for some time. Then we found that 71 per cent of the cows which had been inseminated by the sperm of that bull, taken the last two times before the bull was stopped, stood there in the herds as the only
reactors, among otherwise clean herds. There could be no doubt that the sperm really had infected the cows.

That was the first example. The next year we had a similar example and a more serious one on another island which had been cleared up. In the first case we found that most of the cows that were infected did not abort before they were sold from the herds, but the next year it was not cleared up so early and we found that between forty and fifty herds were infected in the same manner.

As far as I can remember there were about twenty-six of the herds in which the inseminated cows were the only reactors in those herds which we knew had been free of reactors earlier. In more than ten of the herds they were examined so late that the primarily inseminated cows aborted and caused an acute abortion in the herds before they were found and the primarily infected animals could be sold and slaughtered.

This case caused a very serious criticism on the part of the farmers, because they could not understand why such a thing should happen. Our civil veterinary administration took up the bull problem and made a systematic investigation of the bull centers over the country in the following years and in those years we have been able to demonstrate quite a number of similar cases.

I will not have time now to go into the details of those investigations, but the result was that through laws and regulations we have controlled such bull centers. Those bulls must be under control for brucella infection, and when the bulls go to these centers they must be free of brucellosis. Once a year a blood sample must be taken. Twice a year sperm samples must also be taken and four times a year complete investigation of the bulls must be made to make sure that we don’t have brucella infection among those bulls.

The investigation of sperm samples is made in this way: A microscopic examination must be made. In the most important locations in the bull’s genital organs there is inflammation in the seminal vesicles and in those locations you generally can’t determine by clinical examination any inflammation without making a rectal exploration. For that reason, the first thing is that the man who is in charge of the collection of this sperm must be instructed to follow the microscopic appearance of the sperm very closely, and if he finds anything abnormal the bull must be stopped until closer examination can be made so that we are sure there is no danger of infection.

The microscopic examination is very important. In the laboratory we always make an agglutination test on the sperm plasma because we find that those animals that have a positive agglutinin titer in the sperm plasma are those that have inflammation in one or another part of the genital tract and the general prognosis on those bulls, after a longer or shorter time, will be slaughter. Only those bulls which show blood reaction without symptoms in the sperm show a better prognosis, because many of those bulls, later on will lose their blood titer and will clear up; and then, after a quarantine they can be used again.

We also use a catalase test on the sperm plasma and a microscopic examination of the sediment to demonstrate whether pus cells are present. Then we cultivate from the sperm sample to demonstrate brucella bacteria and on all abnormal sperm
REMARKS ON BRUCELLOSIS IN DENMARK

samples we inoculate guinea pigs. In this way we try to make sure that the bulls are not infected.

Our breeder organizations now are trying always to have the bulls on special farms where there will be no other cattle than bulls, or a single or a few cows used just for collecting the sperm. We find this is the safest way to get rid of brucella infections in bulls.

The next best way is to have them on a brucellosis-free farm in an isolated bull stable; but there is always a danger, we have found, because such a herd may be newly infected and we find that if you have a bull on a farm where many clinical abortions are occurring, the bulls are in a rather dangerous position. You will find quite a number of them having blood titers in time and a few of them will become infected and develop local abscesses in the genital tract.

For that reason we are now taking care of the bulls as much as possible and are protecting them against brucellosis. We have found that in this way infection plays a role when you are working on a systematic eradication program and an area program and that you must control those breeding animals.

In closing, I would like to say that it is our experience in Denmark, too, that if we compare our brucellosis work with our tuberculosis eradication work we find that in brucellosis infected herds there is a much more active center for spreading of brucella infection than in tuberculous herds. When we started tuberculosis eradication we found a number of new infections coming from such infected herds, but the brucella infected herd in this respect is giving many more newly infected herds in the surrounding areas.

We can't tell in all cases how the brucella are spread from such brucella sperm. I have mentioned one of the ways that we know of spreading brucella infection from infected herds, but it is our feeling that we still should have much more information concerning the ways in which brucella infection may be spread from infected herds. It constitutes quite a problem.

According to the tendency toward self-limitation, especially when there are small herds to work with, I think we are making progress in our brucellosis eradication work. We can see it according to statistics, but it would be much easier if we could stop some of those new infections, of which we have too many.
APPLICATION OF THE (A.B.R.) RING TEST IN AREA BRUCELLOSIS CONTROL


State Department of Agriculture, Columbus, Ohio

The brucellosis control program in Ohio in the past has been based on the blood agglutination test as employed in practically all states. The inability to obtain and maintain sufficient veterinary practitioner participation in this type of program had an adverse effect on the progress that could be made; both from the standpoint of initial herd tests and the follow-up testing of reactor herds.

Due to the inability to maintain efficient initial and follow-up testing of infected herds, as well as the long interval between area tests desirable results were not attained. Statistics indicate that some areas retested at three-year intervals showed approximately the same or a greater percentage of infection than was found on the initial test. It is of significant interest that the majority of this infection was disclosed in previously free herds. Such results were considered unsatisfactory to the livestock breeders and appeared to represent an unwise expenditure of brucellosis control funds.

These factors resulted in demands from Ohio breeders for a more efficient brucellosis control program.

Work reported by Jepson of Denmark and Roepke of Minnesota on the A.B.R. milk ring test as an approach to possibly more efficient means of control, precipitated an interest in Ohio. Through cooperation with the Ohio Agriculture Experiment Station Animal Research Laboratory and the State and Federal Division of Animal Industry, preliminary disease control work was undertaken regarding the utilization of this test.

Preliminary studies were made on composite individual herd milk samples collected in counties and townships in conjunction with the area blood testing program. Milk samples were collected by state or federal employed veterinarians at the time they were on farms to bleed the herds. Antigen employed in these milk tests was prepared in accordance with methods outlined by Jepson and as modified by Roepke.

Results obtained from these initial studies indicated a very satisfactory correlation between the milk ring and blood agglutination tests. These studies were continued on a small scale until one county became interested in utilizing this test on a county-wide basis. Milk for testing was collected from shippers' cans at collection or processing plants. Results of this county-wide test were in substantial agreement with those of previous tests.

At this time one township in another county became interested in this approach to brucellosis control. In this instance, for easier application and because the number of herds involved was small, it was deemed advisable to collect milk samples on a farm to farm basis. This procedure met with excellent results from the standpoint of application as well as statistical herd history. By this method milk samples were obtained from each milk-producing herd, a condition which was not true in the milk plant collection approach. It also eliminated the requests from the management
of collection or pasteurizing plants for ring test results and moreover confined the testing to the assigned area which was not possible when samples were collected at processing plants. Since we were interested in maximum coverage with the ring test in an area program, it appeared practical to apply this latter method of collection.

A mimeographed brief outline of instructions was prepared explaining the milk ring and blood-test program, together with a detachable owner identification and

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<tbody>
<tr>
<td>Negative</td>
<td>1 Plus</td>
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<td>3 Plus</td>
<td>4 Plus</td>
</tr>
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</table>

Any herd showing reactions of one plus or more or reactions disclosed in tubes 2-5 are subjected to the blood test to disclose individual reactors.

herd census form to be completed by the herd owner. In area counties inaugurating the brucellosis test, interested local breeders from each township are employed to distribute the instruction sheet and milk collection vials on a farm to farm basis. Each herd owner is advised to collect one teaspoonful of milk from each can of well stirred milk, and add it to the collection vial; and to complete and attach the information sheet to the collection vial. These vials are then collected the following morning and delivered to a mobile laboratory located in the area in process of testing. The cost of this collection service is fifty cents per herd. Collectors are also instructed to inform all breeders of beef cattle that they are eligible for a free blood test of their herds if desired.

Milk samples delivered to the laboratory are immediately prepared for ring test-
ing. The interpretation is made by the uniform method of negative, one plus, two
plus, three plus and four plus reactions. Any herd not negative to the ring test is
subjected to the blood agglutination test.

It has been found that this approach has improved our ability to cover an area to the
point where one county was completed in ten days. The utilization of local assistance
materially stimulated a desire to participate in this program. The majority of reactor
cattle are being promptly branded and tagged and removed to immediate slaughter
although no indemnities are paid.

State, federal and local veterinarians are utilized for the follow-up retesting of
reactor herds, which is most essential for the control of brucellosis. The application
of this outlined approach enabled the testing of eight counties during a ninety-day
period.

As this program expanded antigen production became a problem. The Bureau
of Animal Industry was contacted relative to supplying ring test antigen, this was
provided and permitted the utilization of a uniform standardized antigen in all areas
and the advantage of more uniform interpretation.

At the present time the milk ring test is an index test. Ring test positive herds
are being bled to locate the infected animals. It is intended to repeat these tests at
six-month intervals to locate new centers of infection plus a frequent check on pre-
viously infected herds. It is felt after repeated application of this method of con-
control, areas can be prepared through the reduction of the incidence of the disease
to a point where one complete area blood test will enable accreditation. It may be
possible through the judicious application of this approach to partially replace, if
not entirely eliminate the area blood test as a means toward area accreditation.

The economy of the ring test program is also worthy of consideration. Currently
it is estimated that two and one-half to three counties can be tested under this pro-
gram for approximately the same expenditure as for one county under the original
blood test program.

The estimated cost of the ring testing program includes the blood testing of milk
ring positive herds and retesting of infected herds.

In addition to the economy the psychological effect of this program cannot be
overlooked. In areas where the ring test has been employed a higher degree of en-
thusiasm has been evidenced by the breeders for the control and eradication of this
disease from their herds.

To portray the apparent efficiency of this type of program, data were compiled
from initial tests completed from four counties. For the sake of brevity a consoli-
dated report is offered. A total of 6,815 herds were tested with a complete agree-
ment in 5,986 herds or 87.8 per cent total agreement.

It is important to emphasize that no degree of reaction to the ring test can be
ignored in that it was found that approximately 60 per cent of the herds which
showed a one plus reaction proved to be positive or doubtful to the blood test.

The preliminary studies made to date indicate the ring test does possess merit
and should be given more serious consideration as an adjunct in the control and
eradication of brucellosis.
WHAT IS KNOWN ABOUT IMMUNITY TO BRUCELLOSIS

K. F. MEYER, M.D.

George Williams Hooper Foundation, University of California, San Francisco

Although the store of information about immunity to brucella infections is considerable, it is frequently presented without the necessary understanding of certain basic biologic concepts and facts characteristic of infectious disease. Every publication wrestles with some phase related to the well-known facts that infection does not necessarily mean clinically manifest disease and that the reactions of the infected vary rather widely. "Latent" or "subclinical" infection, "natural resistance" and such terms are used to describe the quiescent infection process in the host. To use the available information to the utmost, the infection in both man and animals must be investigated, for what is learned about one is often applicable to the other.

Among the various factors which determine the establishment and the course of brucellosis in man, his susceptibility to invasion or his ability to accept the brucella as a parasite is important. True the ability of the micro-organism itself to localize and to grow in the tissues of man and animals depends on a great many complex, probably uncontrollable and as yet unknown factors, but the reaction of the infected to each of the three species of Brucella—abortus, melitensis and suis—also varies considerably.

Some relative data, collected at random, clearly illustrate one of the many variations in host susceptibility: Ten members of the crew of the S. S. Joshua Nicholson drank goats' milk and 8 of them fell ill with Malta fever (Report of the Mediterranean Commission). Between 400 and 500 persons consumed goats' milk infected with Br. melitensis, but only 35 manifested clinical infections (Lake, 1922). On a sheep farm in the North Caucasus, 631 men and women were exposed to Br. melitensis; 123 (19.5 per cent) gave serologic and allergic reactions indicative of infection. Of interest are the facts that in the infected group, the infection rate was 77 per cent in veterinarians, 52.8 per cent in sheep herders and 50 per cent in animal attendants (Popov, 1937). These and similar observations indicate that the susceptibility or disposition of man to Br. melitensis is around 50 to 80 per cent. Under severe exposure, the infection index expressed in frank and abortive clinical attacks may be as high as 40 per cent, while the rate for latent infections may be slightly higher. There are always more latent than clinical infections in both Br. melitensis and Br. suis infections.

Unfortunately, comparative information concerning the disposition of man to infection by Br. abortus, the most common of the three in the United States, is quite meager. Recent epidemiologic observations in Iowa, California and Minnesota (Jordan and Borts, 1946; Meyer and Eddie, 1943; Spink, 1950) support the deduction that in all probability not more than 50 per cent of the human population is susceptible to Br. abortus infection. This conclusion is supported by the interesting fact that clinical brucellosis is not common among veterinarians in England, even though they are exposed to the risk of Br. abortus infection in their obstetrical practice. The percentage of latent infections, as judged by serologic
tests, may be as high as 58.3 per cent (Beattie, 1938), in contrast to the 77 per cent in melitensis infections. It seems that Br. abortus is fairly infective and therefore becomes established in the tissues at least temporarily.

Since the ultimate goal of all attacks on brucellosis is to eradicate this disease which menaces man's health and is of considerable economic importance to the livestock owner, the reaction of the infected assumes special significance. As he views the over-all picture, the livestock owner wants to know how to protect himself and his stock against this infection, more specifically, how immunity is acquired and how good it is. In an attempt to answer these questions, it would perhaps be profitable to see what is known about the naturally resistant, then about the infection process in the infectable and finally about what can be done to augment the natural defenses of the body to achieve immunity.

**NATURAL RESISTANCE**

In only a small proportion of Br. abortus infected persons are the conditions favorable for the production of clinically detectable disease. By contrast, it appears that Br. melitensis and probably many strains of Br. suis not only have a high infection rate, but cause clinical disease in a large number of cases. The complicated factors which in some way determine whether the infection will remain unrecognized and mild or become conspicuous and severe in a given individual remain obscure. Obviously, the immunity which results from infection alters the susceptibility. It is frequently overlooked, however, that the development of immunity depends on constitutional factors of the host itself. An individual fully endowed with a mature immunity mechanism will react effectively against a heavy continuous infection, while a less fortunately endowed person will contract an infection after a relatively small and discontinuous exposure.

The pandora box of reports furnishes additional observations concerning natural resistance. For example, in monkeys infected by the cutaneous or subcutaneous route with Br. abortus, there is evidence that the organisms invade the tissues, but, as a rule, to prove that they really continue to stay and multiply there is difficult. Within a month the examined tissues of the monkeys injected with several thousand bacilli are sterile (Huddleson and Hallman, 1929). Symptoms of undulant fever so readily produced with Br. melitensis or suis are rarely seen with Br. abortus, although the serologic and immunologic response may be vigorous (Huddleson and Hallman, 1929; Weigmann, 1931). Experiments on monkeys have shown that the infection-tight immunity against Br. abortus acquired by infection of living organisms will not hold up against cross challenge with Br. melitensis or Br. suis (Meyer and Eddie, 1935). Predisposition and susceptibility or resistance to brucella is a definite characteristic of a certain family of rabbits (Manresa, 1932). The ability to suppress multiplication of the invasive brucella is a function of the genetic constitution of swine (Cameron et al., 1943). Melitensis infection in cattle and abortus or suis infections in goats are self-limited infections (Manthei 1950; Meyer and Eddie, 1935) because of the natural resistance of these species of Brucella. These provocative significant observations have not been followed up, despite the ever-increasing overwhelming evidence indicating that resistance of any animal to a great many infections is a component of its genetic constitution. There can be no doubt that differences in
WHAT IS KNOWN ABOUT IMMUNITY TO BRUCELLOSIS

Innate resistance occur within all animal species. The livestock owner should realize that the breeding, for example, for milk or for beef may breed into the animal a great susceptibility for brucella infection. Conversely, no efforts have yet been made to explore the possibility of increasing the innate resistance of animals by suitable cross breeding. Probably such a step is too revolutionary.

Aside from species and individual variations in susceptibility to accept or to resist a brucella infection, the disposition undergoes ontogenetic evolution which urgently demands careful study. Ever since the days of the Commission for the Investigation of Mediterranean Fever it has been well known that immature herbivorous animals—calves, kids and young ewes—are not readily infected artificially. Dependable statistical data indicate that children under 12 years of age unquestionably have a greater resistance to brucellosis than do adults. In family groups among which the incidence of clinical and latent brucellosis is high, the few apparent attacks in children are usually mild. This comparative immunity of young children to infection is reported from many countries and is interesting in view of the fact that children usually consume large quantities of milk and in certain parts of the world that constitutes direct contact with infection.

As far as available bacteriologic and serologic information indicates, the organisms invade the host, but they do not grow well and some mechanism prevents them from living on in the tissues. Every biologist will recognize that this natural resistance of the young is relative and whenever infections are massive, the clinical response of children differs in no way from that of older age groups. Epidemiologic observations dealing with brucellosis in children in Palermo in the early twenties lend convincing proof to this conclusion (Cristina and Maggiore, 1920). With the breakdown of all measures of hygiene, exposure to massive infections produced in children a disease similar to that in adults.

There are of course exceptions to the rule of the resistant young; Hutchings and his colleagues (1944) found it possible to infect a high percentage of pigs at weaning age.

In most animals, as well as in man, sexual maturation enhances the disposition towards the infection. All the statistical data dealing with age distribution of “no contact” and “contact” groups of brucellosis in man attest to this fact. It would indeed be profitable to inquire into the influence of hormonal factors which may be responsible for the enhanced disposition or the lack of resistance. Furthermore, the incidence of undulant fever shows a preponderance of males over females and this sex difference presents a fascinating problem which is still unsolved. The theory that a peculiar sexotropism is responsible for the localization of the brucella organisms in the chorionic epithelium and the udder, testes or accessory sex glands has limited application for man. But it is rather surprising that the simple observation dealing with the localization of brucella in the seminal ducts of the male guinea pigs has not received the attention of pathologists that it deserves (Hillaerts et al., 1950).

BACKGROUND OF IMMUNITY

Before immunity can be adequately understood, it is necessary to know in some detail the natural reactions of the body to infection by brucella and inquiry into
this aspect again reveals that the infection itself must be studied further if the mysteries of immunity to this infection are to be cleared away.

In some way the localization and persistence of brucella in the tissues of an invaded host that cannot get rid of them is directly related to the mechanism which is apparently used to destroy the micro-organisms. Here knowledge is quite fragmentary, but the unassembled essential facts available, when pieced together from studies on guinea pigs, mice and cattle, reveal the following:

By some means, usually through the skin or the mucous membrane of the digestive or respiratory tract, the organisms gain entrance to the regional lymph nodes. Within a relatively short period they invade the blood stream and then the spleen, liver, lymph nodes and biliary passages. The organism may in time disappear from the blood, even from the spleen and liver, yet persist for months or years in the lymph nodes (Carpenter, 1924; Helms et al., 1932; Singer-Brooks, 1937).

Recent histopathological studies confirm early observations that reticulo-endothelial organs—the spleen, liver, lymph nodes and bone marrow—are constantly invaded by the brucella, and that the unique parasitism of brucella on certain other nonphagocytic cells—mesenchymal and ectodermal cells—apparently serves as a stimulus to the tissue reactions accompanying brucella infections (Fabyean 1912; Smith, 1919; Meyer, 1943; Castaneda, 1947; Braude and Anderson, 1950). The organisms use the tissue cell itself, rather than fluid between the cells, as a source of material for their growth, because the intercellular fluids, except in zones of considerable damage, do not provide a suitable environment for multiplication of the bacteria. By the study of animals and man, conclusive evidence has been established that when brucella organisms invade and multiply in the tissues without causing death of the tissue cells, epithelioid cells reproduce and, along with some white cells from the blood, form tumor-like structures. These “granulomatous” lesions, as they are called, resemble those of tuberculosis and are found in the bone marrow and liver at biopsy, and in the spleen and lymph nodes at autopsy (Sundberg and Spink, 1947; Spink, 1948; Braude and Anderson, 1950).

Future studies must determine the nature of the brucella antigen—the component of the bacteria which stimulates this cellular reaction. There is some evidence that hypersensitiveness to a brucella protein may accelerate the formation of the lesions from which living brucella cannot be cultured repeatedly. However, hypersensitivity does not appear to be essential to the formation of the granuloma in the experimental disease. The granulomatous lesions act not merely to hem in and to imprison the brucella, but probably ultimately to destroy them (Braude and Anderson, 1950). However, this process may be very slow and incomplete. What ultimately leads to the victory of the tissues over the parasite remains to be determined. The digestive enzymatic capacities of certain white blood cells, the mononuclears, to destroy or to check the multiplication of the brucella are in part governed by inherited factors and by acquired immunity.

The pathogenesis and in particular the intracellular parasitism of brucella on cells of various organs—spleen, liver, bone marrow, lymph nodes—in part explain the tendency of brucellosis to be a chronic clinical or more frequently subclinical, latent infection. Whether these inapparent infections ever terminate by complete sterilization of the invaded organs is an old and burning question. Old and new
WHAT IS KNOWN ABOUT IMMUNITY TO BRUCELLOSIS

studies on mice, goats and pigs, by culture at autopsy, indicate as far as technical procedures permit that months and possibly years elapse before the host is completely freed of the brucella organisms (Manthei, 1950; Polding, 1939).

IMMUNITY RESULTING FROM INFECTION

Immediately the next question arises: Does recovery from brucellosis protect the host against reinfection? The available information, though confused, definitely suggests that the acquired resistance to reinfection is not associated with the persistence of living brucella in the lymph nodes or spleen. Immunity to brucellosis is not "infection-bound". The immunity is, however, relative and may be broken in a few individuals by few organisms, but in a much greater number, only massive exposure will break it. Studies on experimental infections in goats and in sheep have demonstrated that postinfection immunity varies from one animal to another, and tends to decrease after the primary infection (Meyer and Eddie, 1935). Of particular interest are the observations that in the majority of experimental superinfections with Br. melitensis, the injected organisms could not be recovered from any of the examined tissues or else they were present only in the lymph nodes nearest to the point of inoculation (Versilova and Štriter, 1937).

From diverse observations published over the years, it appears that the principles of immunity of lower animals to brucella can be applied to man. The British students of undulant fever with extensive experience do not hesitate in stating that postinfection immunity is only slight and that reinfection does occur (Bruce, 1925; Basset-Smith, 1923). Indeed, Hughes (1897) cites the case of an officer who had two definite infections 24 years apart. On the other hand, he noted some protective immunity in adults which he ascribes to infection in their youth. Apparently in brucellosis, just as in enteric fever, the immunity which develops during and after infection is by no means absolute in every individual. At present to define with certainty the period after which he becomes proof against relapses or susceptible to reinfection is impossible. More recent observations in packing-plant employees stress the facts that certain individuals may have brucellosis more than once and that the immunity after a single infection is only relative (Spink, 1948). In this connection, it is overlooked that the relative immunity and relapses have been observed "following disease". Thus it is tacitly admitted that a latent infection entirely inapparent or as a sequel to a very mild infection reflects the inherent potent cellular immunity mechanism of an individual. Conversely, a human being probably contracts clinical undulant fever because his immunity mechanism is deficient. Approached from this point of view, obviously immunity can be studied only through artificial or natural infection. There is no convincing evidence that indirect serologic methods will serve the purpose.

The role of antibodies in the immunity against brucellosis has not been made entirely clear despite the many thousands of papers published on this subject. Something has been learned of their action: Serum that contains antibodies against brucella causes them to agglutinate or clump together; it promotes the efficiency of the white blood cells in ingesting the organisms; complement fixation occurs when the serum is appropriately combined with brucella and some of its antigenic components; it forms precipitates with protein and carbohydrate of the bacteria. Of
considerable interest is the fact that when relatively large numbers of dead brucella organisms are given by mouth or by injection, the agglutinins which bring about the clumping may appear in the peripheral blood serum, but at the same time immunity may be of a very low order.

In addition to the formation of humoral antibodies in the host invaded by brucella, another type of immune process develops, namely an altered tissue reactivity to the bacteria and their components, generally designated as allergy. With the exception of exploratory attempts (Signorelli, 1935), the correlation of immunity and allergy has not been studied to any extent. At least it is known that in reinfection or superinfection the local allergic inflammation bears an important share in fixing and retarding the spread of the organisms to the regional lymph nodes. There is some evidence that an individual highly allergic to brucella antigens may or may not contract clinical brucellosis. The author of this review, highly allergic to brucella, rubbed placental exudate teeming with unquestionably infective melitensis organisms into the skin of his forearm. The local reaction attested to allergy and resistance. The infectivity of the organisms was proved by the fact that the goat which was the source of the exudate and bacilli isolated from her subsequently were the source of two infections—one of an animal caretaker and the other of a pathologist (Meyer and Eddie, 1941). Another individual highly allergic and the possessor of a marked opsonocytophagic reaction died of a Br. suis infection after a massive exposure, probably ingestion of a heavy suspension of organisms (Meyer, 1943). Since an allergic test is not a quantitative measure of immunity and since any immunity in brucellosis is relative, it is impossible to determine the resistance of an individual or of an animal by the intensity of the reaction to the skin test. However, the state of allergy as part of the cellular immunity mechanism must be explored and integrated in any study program of the future.

ARTIFICIAL IMMUNIZATION

As early as 1895 attempts were made to immunize man with antiserum from rabbits, goats, guinea pigs and horses. The early therapeutic results were not encouraging (Eyre, 1907). Prophylactic inoculation with a variety of antigens prepared by a diversity of methods has been advocated as a means of protecting laboratory workers against infection (Wright, 1897; Dubois and Sollier, 1938; Kolmer et al., 1940). The protection afforded, as judged by critical workers, is unsatisfactory (Taylor et al., 1935; Meyer and Eddie, 1941).

Attempts were made to minimize the losses attributable to the main symptom—"contagious abortion"—and to immunize cattle as long as 40 years ago. For the purpose of initiation or mimicking epidemiologic observations, a brilliant step was taken by injecting nonpregnant cows subcutaneously with cultures of living virulent Br. abortus; field tests showed that this type of vaccination produced a definite increased resistance expressed in a lower incidence of abortions. However, it was found that inoculation with living Br. abortus did not prevent localized infection of the uterus or udder. Thus the injected animals became carriers and shedders and obviously brucellosis could not be eradicated by this procedure. Furthermore, the indiscriminate inoculations with live brucella led to the accidental introduction of Br. suis into the vaccine.
It became imperative to strive for a method of immunization which would completely protect the animal against an infection, not merely against abortion, under natural conditions. The efforts of the Bureau of Animal Industry and other institutions in the United States and elsewhere in this direction were crowned by the selection of Br. abortus cultures of low virulence for the active immunization of cattle (Traum, 1950). As an immunizing agent, Strain 19 has been appraised in large-scale experimental and field studies. Many excellent reports attest to the overall good protection this strain affords. It is generally accepted that this strain does establish itself temporarily in the tissues of the inoculated calves. It does not create carriers and spreaders. Since its antigen is weak, the agglutinin titer of the blood serum of the calves disappears within a few months after vaccination. This type of vaccination does not interfere with the usual diagnostic tests (Haring and Traum, 1941; Birch et al., 1941, and others). Little evidence concerning the duration of the immunity acquired is available; in recent years there have been reports that it declines (Beach et al., 1947). Revaccination is probably required in order to prolong the immunity. As might be expected, revaccination rapidly produces development of large quantities of agglutinins, but the titer recedes much more rapidly than it does in animals vaccinated for the first time (Berman and Beach, 1949). Results of current experiments with other attenuated strains or variants are not as yet available (McEwen et al., 1940; Paterson, 1947; Huddleston, 1947). Incidentally, Strain 19 is apparently capable of infecting laboratory workers and vaccinators (Gilman, 1944; Grayson, 1946). Contrary to previous claims, it does not immunize pigs (Kernkamp and Roepke, 1948) or goats (Polding, 1939).

Deprived of all ballast of repetitious publications, the biologic fact which must be faced is that highly invasive and infective strains of Br. abortus produce a higher degree of immunity than do attenuated strains. The ideal strain has probably not been found because the breeding of such a strain is too complicated and too expensive. The difficulties of preparing a vaccine containing known numbers of living bacilli of fixed attenuation and invasiveness have in part been overcome by drying (although I take that back in view of what has been reported this afternoon) (Verwey and Scheidy, 1946), but further study of vaccines produced by this process ("Lyovac") is required. The solution of the caprine brucellosis problem requires a vaccine of equal efficacy, in all probability prepared with a strain developed from Br. melitensis. Nor has a strain suitable for vaccinating human beings been found. Although it has been claimed that vaccination of human beings with living Br. abortus is harmless (Burnet, 1928), experiments on monkeys have shown that even repeated inoculations confer no immunity (Larson, 1948; Elberg and Silverman, 1950). Through preliminary studies, something has been learned of this antigen. One part of it will protect guinea pigs and cattle (Lisbonne and Roman, 1944; Paterson et al., 1947; Paterson and Pirie, 1948). If this antigen or antigenic fraction is used in the proper dose and with suitable adjuvants, it confers a high degree of active immunity to experimental animals against many infective doses of virulent brucella.

At present, experimental evidence, field experience and theoretical considerations permit the following conclusions:

1. That a very moderately active immunity of limited duration may be obtained
with adequate doses of a certain as yet ill-defined antigenic fraction of the brucella organism, provided absorption by the tissues is delayed by an adjuvant and provided the stimulation of immunity is prolonged and repeated.

2. That single-dose vaccination with live attenuated organisms, because they invade, multiply, and temporarily persist in the tissues, exerts a powerful immunogenic effect. As living complete antigenic units, vaccine is brought into more intimate contact with certain cells of the body and hence leave more permanent imprints on these cells and on their descendants than do soluble antigens.

Finally, it is unlikely that vaccination is any more effective at the present than infection itself in protecting an animal against brucellosis. Since the immunity depends on hereditary constitutional factors and is therefore too often relative, suitable procedures for renewing immunity frequently must be adopted.

It has been the purpose of this brief and obviously incomplete review of the immunology of brucella infections to present some facts which may be useful in understanding some basic biologic facts about brucella infections. No one will quarrel with the premise that a solid immunity which will protect animals or man against the vicissitudes of continuous though variable exposure to infection is the condition sine qua non in a control program. Newer knowledge admits that this prerequisite is only in part fulfilled by the single-dose inoculation procedure. The principle of frequent revaccination has proven sound in many recent immunization practices. How it can be applied to the ultimate eradication of brucellosis without disturbing the diagnostic serologic testing methods is a problem of challenging magnitude worthy of the efforts of your organization.

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WHAT IS KNOWN ABOUT IMMUNITY TO BRUCELLOSIS


REPORT OF COMMITTEE ON BRUCELLOSIS


A Committee on Brucellosis, formerly known as Bang's disease and prior to that, abortion disease, has been appointed by the United States Livestock Sanitary Association annually for at least the last 35 years. While progress in the control of this disease sometimes appears slow, study of the reports of the committees over the years indicates a vast amount of knowledge gained pertaining to this disease and a crystallization of thought regarding the procedure required for its control and eradication.

The report of the Committee in 1947, of which Dr. R. W. Smith of New Hampshire was Chairman, included recommendations for State and Federal legislation for sound disease control practices and also an outline of four methods of control designated A, B, C and D. It is the belief of the Committee that one of these plans of control is applicable to any herd depending upon existing conditions. It should be emphasized, however, that plans B, C and D provide for preparing a herd to eventually adopt Plan A as soon as it can be done without undue financial loss to the owner. We are encouraged at the progress being made in the country as a whole and pleased to report that there are three States: North Carolina, New Hampshire and Maine, which have qualified for the enviable position of modified certified brucellosis-free areas.

The recommendations made in 1947 as amended in 1948 and 1949 have received wide endorsement by all groups who have used them as a basis for undertaking a solution to the brucellosis problem. Your Committee approves these recommendations as presented in the 1949 report.

Your Committee believes it is imperative that all regulatory bodies and livestock owners keep in mind the fact that in the vast majority of instances clean herds are reinfected by the introduction of diseased animals.

"ABR OR RING TEST"

Research has been continued throughout the year in the development of the so-called ABR or ring test of milk and cream for the detection of brucellosis infected herds. The Bureau of Animal Industry of the United States Department of Agriculture is to be complimented upon the restriction of the distribution of the antigen for conducting the ring test to official livestock sanitary regulatory bodies. We believe this method of testing is worthy of consideration.

SWINE BRUCELLOSIS

The 1949 Committee for the first time presented a definite recommendation for the control of brucellosis in swine and the establishment of certified brucellosis-
BRUCELLOSIS

free swine herds. Your Committee wishes to again recommend the adoption of these rules by the various states.

RESEARCH

Your Committee recommends continued research of all phases of brucellosis of domestic animals, particularly in the control of brucellosis in swine and in the development and improvement of immunizing products.

UNIFORM METHODS AND RULES

Your Committee recommends the uniform methods and rules for the establishment and maintenance of “Certified Brucellosis-Free Herds” of cattle and “Modified Certified Brucellosis-Free Areas” adopted October 14, 1949 and approved by the Bureau of Animal Industry, United States Department of Agriculture November 10, 1949 be amended to read as follows:

PROPOSED REVISION TO UNIFORM METHODS AND RULES FOR THE ESTABLISHMENT AND MAINTENANCE OF CERTIFIED BRUCELLOSIS-FREE HERDS OF CATTLE AND MODIFIED CERTIFIED AREAS


Part I.

Individual Certified Herd Plan

Sec. 1: A “herd” shall be defined as including all animals over six months of age except steers, spayed heifers, and officially vaccinated animals not more than 24 months of age.

Sec. 2: Herds may be placed under supervision for certification as brucellosis-free upon complying with provisions governing the testing requirements of the respective state-federal cooperative program.

Sec. 3: Herd tests shall be made at intervals of not more than 60 days until all evidence of infection has been eliminated. A herd may be certified as brucellosis-free when it has passed at least three consecutive tests, with the first clean test and the certifying test not less than 12 months apart, provided that animals under 30 months of age vaccinated as calves shall not be required to be negative to the test, and further provided that if no evidence of infection is disclosed on the first herd test, a herd may be certified as brucellosis-free when it has passed one additional clean test conducted not earlier than six months following the first herd test.

Sec. 4: Certified brucellosis-free herd certificates which shall be valid for one year unless revoked, may be issued by cooperating state and federal officials.

Sec. 5: Herd certification may be extended for a period of one year upon evidence of a negative herd retest.

Sec. 6: If the retest of a certified herd, or of animals from such a herd, reveals
one reactor, the entire herd shall be retested. Such herds shall be re-certified on the results of two negative tests conducted at not less than 60-day intervals, the first such test at least 60 days after the date of the test on which the reactor was disclosed.

Sec. 7: If the retest of a certified herd or animals from such a herd reveals more than one reactor, the herd shall be retested as under Sec. 3.

Sec. 8: If the retest of a certified herd discloses suspects, but no reactors, the suspicious animals only may be retested. If all suspects are available for retest and are negative, the herd test may then be considered negative. If the retest does not include all suspicious animals, or if one or more reactors result, the herd shall be classed as infected and tested as under Sections 6 or 7.

Sec. 9: Animals in herds where infection has been disclosed will be restricted in movement to the premises until the herd has passed a negative test not less than 30 days following the test on which reactors were last revealed.

Sec. 10: Additions:
1. To certified herds:
   (a) From herds with equal status.
   (b) From once clean herds, (1) vaccinated animals up to 24 months of age on certificate of vaccination—over 24 months, if negative; or (2) non-vaccinated animals on evidence of negative retest not less than 60 days from date of negative herd test.

2. To once clean herds:
   (a) From herds with equal or superior status.
   (b) From other herds, (1) vaccinated animals up to 24 months of age on certificate of vaccination—over 24 months, if negative, or (2) non-vaccinated animals if tested negative, then segregated and retested negative in not less than 60 days.

Sec. 11: Additions introduced from herds without equal status, under qualifying conditions of Subsections (b), Sec. 10, shall not receive new herd status for sales purpose until they have been members at least 30 days and included in complete herd retest.

Sec. 12: Premises shall be cleaned and disinfected under supervision or proper direction, following removal of reacting animals.

Part II

Modified Certified Area Plan

The provisions of the individual certified herd plan that relate to testing, cleaning and disinfection shall apply to the modified certified area plan. The extent of the area shall be determined by the cooperating state and federal agencies. When an area has been designated and the required percentage of herds and cattle included under any of the plans, the area shall be placed under quarantine and the following rules apply:

Sec. 13: Cattle from officially certified brucellosis-free herds, and cattle from negative herds in modified certified brucellosis-free areas, when officially blood tested with negative results within one year of the date of shipment, may enter other modified certified areas without being retested for brucellosis. All such cattle
shall be individually identified and shall be accompanied by approved certificates of health indicating herd and animal status.

Sec. 14: Cattle from herds under federal-state supervision for the control of brucellosis in which all animals in the herd over six months of age (except animals officially vaccinated as calves and under 30 months of age) were negative to the official blood agglutination test for brucellosis within 90 days of the date of entry, and the individual animals to be moved were negative to an official retest at least 30 days from the date of the previous herd test, and within 30 days before entry, may enter a modified certified brucellosis-free area or an area in the process of such certification without further restriction.

Sec. 15: Heifers under 24 months of age officially vaccinated as calves when 6 to 8 months of age and coming from (a) negative herds in modified certified areas, (b) individually certified brucellosis-free herds, or (c) herds under federal-state supervision which have passed a test as under Section 14, may enter a modified certified brucellosis-free area or an area in the process of certification without further test when individually identified by mark, brand, tattoo or other acceptable identification, and approved by the proper sanitary official of the state or origin.

Sec. 16: Breeding cattle not over 24 months of age, officially vaccinated as calves when 6 to 8 months of age, which do not qualify under Sec. 15, may enter a modified certified brucellosis-free area providing they do not show blood agglutination reactions higher than incomplete in dilution of 1/100 and the animals are maintained in quarantine until they have passed a negative blood test.

Sec. 17: All other male or female cattle over 6 months of age, except steers, spayed heifers and cattle intended for immediate slaughter, shall be required to pass a negative officially recognized blood agglutination test for brucellosis within 30 days prior to the date of entry, and shall be maintained in quarantine separate from other cattle and retested in not less than 30 nor more than 60 days after the date of entry. If passed, they shall be released from quarantine.

Sec. 18: (a) If as a result of a test of all the cattle within an area which are required to be tested according to the provisions of Section 1, the number of reactors (exclusive of officially vaccinated animals under 30 months of age) does not exceed 1 per cent of the cattle, nor the herd infection exceed 5 per cent, the area may be declared modified certified brucellosis-free for a period of three years, provided that infected herds shall be quarantined until they have passed at least 2 consecutive tests not less than 60 days apart.

(b) If a test of all the cattle in an area discloses more than the above percentages, the infected herds shall be quarantined and retested at periods of from 30 to 60 days. If as a result of any such retest made within a period of 6 months from the date of the last test of all cattle in the area, together with a retest of not less than 20 per cent of other representative properly distributed herds, the number of reactors does not exceed 1 per cent, nor the herd infection 5 per cent, based on total herd and cattle populations, the area may be declared modified certified brucellosis-free for a period of 3 years. Infected herds
shall remain in quarantine until they have passed two consecutive tests not less than 60 days apart.

Sec. 19: At the expiration of the 3-year period, areas certified as above may be re-certified for another 3-year period when the results of any retest of all herds in which infection was reported at the time of the last complete area test, or since, together with the results of a retest of 20 per cent of other representative herds, reflect a rate of infection which does not exceed 1 per cent of the cattle or 5 per cent of the herds so tested. This percentage shall be based on most recent area test data, and shall not include herds previously tested for this same purpose.

Sec. 20: Any area not qualifying for re-certification under Sec. 19 shall be subject to retest of all cattle.

Sec. 21: It will be permissible in modified certified brucellosis-free areas to have not to exceed 1 per cent of the total number of herds in the area maintained as infected herds under the provisions of the uniform program which govern the handling of such herds. The cattle contained in these herds shall be included in the total number of reactors when determining the percentage of infection as provided under Sections 17, 18 and 19 of these rules.
EXPERIENCE IN PENNSYLVANIA IN TRACING THE ORIGIN OF CATTLE REPORTED ON REGULAR KILL TO BE AFFECTED WITH TUBERCULOSIS

H. A. MILO, V.M.D., Chief
Tuberculosis Eradication Division, Harrisburg, Pennsylvania

Historically, it will be recalled that the first tuberculin test applied in the United States was conducted by Dr. Leonard Pearson, March 16, 1892. Dr. Pearson, who at that time was Dean of the School of Veterinary Medicine, University of Pennsylvania, and also state veterinarian applied this test to a herd of cattle on the Clearmont Farm in Delaware County, Pennsylvania. Publication of the results of the post-mortem examination of the reactors attracted nation-wide attention.

From that date, tuberculin testing in Pennsylvania continued on a limited scale until the United States Bureau of Animal Industry approved the uniform plan adopted by the United States Livestock Sanitary Association. This was the basis of the "accredited herd" and the "accredited area" plans. From 1901 until 1917, herds were tuberculin tested under what has been described as the Pennsylvania Plan, which is similar in many respects to the plan now in effect. While indemnity for tuberculin reactors was available from the State during this period, federal indemnity was not an added inducement until October, 1918.

The first county-wide tuberculin test applied in Pennsylvania under the area plan was conducted in 1923 and testing continued under this plan until the State was declared a Modified Accredited Bovine Tuberculosis Free Area in December 1936. As a result of the first complete state-wide tuberculin test under the area plan, a tuberculosis incidence of 9.29 per cent was disclosed in a cattle population of 1,225,000.

Tuberculosis has been reduced gradually over this period, as reflected in the last state-wide tuberculin test of all dairy and breeding cattle under the area plan. This indicates a disease incidence at this time of 0.17 per cent in a cattle population which now approximates 1,400,000 animals.

To attain the results thus far achieved required the application of over 15,000,000 tuberculin tests, the removal of 326,863 reactors was required and the expenditure in state and federal indemnities in excess of $21,000,000.

In Pennsylvania, there are approximately 7,200 herds, comprising 179,093 cattle operating under the Individual Accredited Herd Plan. On the last tuberculin test applied to these herds, the percentage of reactors was 0.22.

During the past eight years, or since the beginning of World War II, approximately ninety per cent of all tuberculin testing in Pennsylvania has been conducted by accredited veterinarians. It will be noted, that the reduction in the percentage of reactors disclosed in herds tested yearly under the Individual Accredited Herd Plan is not comparable to the reduction of reactors in herds being tested at three and six year intervals under the area plan by the same accredited veterinarians.

In addition to the abattoirs operating under federal meat inspection in Pennsylvania, we have 46 abattoirs that have full-time meat inspection under state
supervision. This affords us a splendid opportunity to obtain post-mortem reports on cattle in the regular kill that are found to be tuberculous.

During a 12 month period, from October 1, 1948 to September 30, 1949, we received 64 F. I. Forms 11-C, or the equivalent, where state meat inspection is concerned. In 30 of the 64 reports referred to, covering cattle slaughtered on regular kill in which lesions of tuberculosis were found upon post-mortem examination, generalized tuberculosis was encountered and the carcasses of these animals were condemned. It was possible to trace the origin of animals listed in 45 of these report forms and fifteen, or 33 1/3 per cent of these 45 cases were traced to herds operating under the Individual Accredited Herd Plan.

Tuberculin tests were applied to all animals on the premises in the 45 herds where identification made it possible to trace the origin. These herds comprise a total of 996 animals and resulted in the disclosure of 155 reactors, or 15.6 per cent of the cattle population on these farms. Infection was revealed in 23 of the 45 herds tested. The 45 herds tested were placed under quarantine and in each instance will be required to pass three negative tests before the quarantine will be revoked. Post-mortem reports covering the 155 reactors reveal that 25, or 16.7 per cent of those animals failed to disclose macroscopic lesions of tuberculosis. However, 21 carcasses, or 13.5 per cent of the total number of reactors involved, were condemned on account of generalized lesions of tuberculosis. The 45 herds referred to were located in 21 of the 67 counties in Pennsylvania. The 155 reactors disclosed in the testing of these 45 herds constitutes 13.6 per cent of all reactors reported in tests under the cooperative project during the same period.

Three of the Form 11-C reports were for animals that were classified as reactors to the blood agglutination test for brucellosis. In applying tuberculin tests to the cattle on these three premises, one herd was found to contain 12 tuberculin reactors. The other two herds were negative.

As the result of the first retest conducted on the 45 herds in question 35 additional reactors were revealed, post-mortem reports listed 26 as showing lesions of tuberculosis and one carcass was condemned due to generalized lesions. In the second retest of these herds, 35 reactors were disclosed, 29 showing lesions of tuberculosis on post-mortem and one carcass being condemned due to generalized lesions. As a result of the third tuberculin retest applied to the herds remaining under quarantine, two additional reactors were removed, both showing lesions of tuberculosis at time of slaughter. Ten of the 45 herds involved in this 12 month period remain under quarantine.

On October 1, 1949, the same procedure was adopted for a tabulation of this material in a second year study of this problem. However, the figures disclosed for the second period cover only 11 months. We have received 100 F. I. Forms 11-C, or their equivalent, during the second period, which represents an increase of 36 over the previous year. In 38 of the 100 reports referred to, generalized tuberculosis was encountered and the carcasses of these animals were condemned. This discloses an increase of eight over the 30 reported for last year.

It was possible to trace the origin of animals listed in 68 of these report forms and again 21, or approximately 1/3 of these 68 cases, were traced to herds operating under the Individual Accredited Herd Plan. Tuberculin tests were applied to all animals on the premises in the 68 herds where identification made it possible to trace the
origin. These herds contained 1,648 animals. The reactors disclosed numbered 293, or 17.7 per cent. Infection was revealed in 43 of the 68 herds tested. The 293 reactors represent an increase of 138 over the 155 that reacted the preceding year.

Post-mortem reports on the 293 reactors reveal that 39, or 13.3 per cent failed to disclose macroscopic lesions of tuberculosis. However, 32 carcasses, or 10.9 per cent of the total number of reactors involved, were condemned on account of generalized lesions of tuberculosis.

These 68 herds were located in 23 of the 67 counties in the State. The 293 reactors disclosed in the testing of these 68 herds constitute 41.8 per cent of all reactors reported in tests under the cooperative project during the same period. Our schedule under the area plan for 1949 comprised the testing of 23,734 herds with a cattle population of 278,467 animals and the tuberculin test revealed 409 reactors, or 0.15 per cent in 170 herds. This emphasizes the importance of tracing the origin of cattle, which show lesions of tuberculosis upon post-mortem examination in slaughtering establishments.

Four of these Form 11-C reports covered animals which were classified as reactors to the blood agglutination test for brucellosis. This is an increase of one over the previous report. However, when a tuberculin test was applied to the cattle on these farms, two herds were negative and one reactor was revealed in each of the other two herds. Both of these disclosed lesions of tuberculosis at the time of slaughter. In this respect, this is in marked contrast compared to the preceding year, since one more herd was involved, but only two reactors were disclosed in two herds, whereas twelve reactors appeared in one herd the previous year. Sufficient time has not elapsed during the second year period to furnish conclusive information on the retesting of these herds.

When this study was inaugurated in October 1948, it soon became apparent from the difficulties encountered in tracing the origin of these cattle, that the assignment of identifying ear tags to the various veterinarians was an item of considerable importance and would require alterations in the system employed in the past, in addition to the adoption of other measures required to maintain the identity of animals passing through the hands of dealers, public stock yards and community sales, to trace their origin.

It has become apparent that some dealers labor under the impression that it may jeopardize their business relationships with herd owners if animals which are found to be tuberculous on post-mortem examination are traced to farms where they were purchased. In at least some instances, these dealers have been reluctant to cooperate in the tracing of reactors. Some have gone as far as deliberately destroying means of identification.

We entertain the hope of improving our recording system and the assignment of ear tags distributed to veterinarians, so that in the future we can reduce the rather high percentage of cases in which we are unable to trace the origin of straight slaughter cattle reported as showing lesions of tuberculosis.

In an effort to reduce further the incidence of bovine tuberculosis, the use of the cervical intradermal tuberculin injection has been employed as an aid in locating infected animals in problem herds such as those under discussion. It has been my good fortune along with my associates engaged in this project to have had the opportunity to apply this test to 1096 cattle, in the past 23 months. While the scope
of this project has been limited thus far, the results seem to reflect the importance of the cervical test.

In applying the cervical injection in connection with the regular double injection method to 1,096 cattle, 235 or 21.4 per cent gave a tuberculin reaction at one or more points of injection. Post-mortem results reveal that 39 reactors, or 18.5 per cent failed to reveal macroscopic lesions of tuberculosis. However, 18 or 7.6 per cent of these reactors disclosed generalized lesions of the disease and two carcasses were passed for sterilization.

A recapitulation of the above figures shows that 142 or 60.4 per cent reacted at all three points of injection. Post-mortem reports of this group reveal that 20, or 14 per cent were listed as no-visible lesion cases; and, 11 or 7.7 per cent were condemned due to generalized lesions of tuberculosis, and one carcass was passed for sterilization.

Only seven of the 235 reactors gave a reaction to the caudal injection alone, three were positive, and four were negative on post-mortem examination. There were no generalized cases in this group.

Of the total number of reactors, two animals were classified as reacting to the vulva injection alone and both showed lesions at time of slaughter.

Thirty-seven, or 15.7 per cent reacted to the cervical injection alone. Post-mortem reports listed 36 of this number as showing lesions of tuberculosis and one no-lesion case. Five carcasses in this group were condemned due to generalized lesions of tuberculosis and one carcass was passed for sterilization.

In this connection it is interesting to note that 23 of these 37 animals, which reacted only to the cervical injection, were in a single herd, which had been tuberculin tested 60 days previously in a manner not considered satisfactory. Because the same sites of injection were used for the caudal and vulva tests, there is a possibility that these areas were desensitized and due consideration should be accorded this fact.

In retest of the remainder of this herd in approximately 90 days, the injections were made on the opposite sides to avoid the possibility of encountering desensitized areas. Twenty-two reactors were revealed at this test, only one giving a cervical reaction alone. It showed lesions at slaughter.

The 47 reactors in this group at subsequent tests responded to the various combinations of injections at two points. Of the 235 reactors only 19 failed to react to the cervical injection. The use of the cervical tuberculin test, when employed in combination with the double injection method is suggested as a further step in the detection of hidden sources of infection.

There is ample evidence to indicate that efforts expended and the results disclosed in this enterprise have served to alert veterinarians engaged in this project to the fact that, regardless of the present low incidence of infection, tuberculin testing of cattle still requires adeptness and is pre-eminently more than a mere perfunctory means of complying with regulations or satisfying a city ordinance.

At this stage of the tuberculosis eradication campaign, it is apparent from the results of our studies that a more efficient system must be devised to enable regulatory officials to identify and trace the origin of all animals found to be tuberculous at the time of slaughter. It is hoped that possibilities in this respect will be further explored in order to hasten the conquest of bovine tuberculosis in the individual states and throughout the nation.
PROGRESS IN CONTROL OF BOVINE TUBERCULOSIS IN CANADA

K. F. WELLS V.S., D.V.M.
Associate Chief Veterinarian, Health of Animals Division, Department of Agriculture, Ottawa, Ontario, Canada

The main purpose of this brief review is to indicate the advances made in the control of bovine tuberculosis in Canada during the past five years.

While it is intended to deal specifically with the work done in that direction during the period April 1, 1945 to July 31, 1950, it would appear desirable to mention briefly, the early history of tuberculosis control in Canada.

The first control measures were adopted in 1896 and consisted of free tuberculin testing of a small number of cattle herds. Compulsory marking of reactors to the tuberculin test came into effect in 1903. The Supervised Herd plan was adopted in 1905, but has been almost entirely displaced by the Restricted Area plan—except in a few outlying areas which have not as yet been brought under the Restricted Area plan. In 1914 the Municipal Tuberculosis Order was brought into effect; this Order was in operation until the regulations for the establishment and maintenance of Restricted Areas for the eradication of bovine tuberculosis came into operation in 1922, after which the M.T.O. faded gradually from the picture. The Accredited Herd plan came into operation in 1919 and has been continued to the present day.

Before outlining the position as of 1945 compared to 1950, I will clarify the difference in our terms “Restricted Area” and “Accredited Area”. All areas established for the eradication of bovine tuberculosis in Canada are legally designated as “Restricted Areas”. When the incidence of tuberculosis in a Restricted Area has been reduced to $\frac{1}{2}$ of 1 per cent or less by testing all cattle therein, the area is then described as an Accredited Area. If the incidence of tuberculosis has been reduced to $\frac{1}{4}$ of one per cent the area is accredited for a period of six years; if reduced to one half of one per cent, or less, but over two tenths of one per cent, the area may be accredited for a period of three years. Thus, if the cattle within an area have not reached Accredited Area health status, or the period of accreditation has been allowed to lapse without a retest of all cattle within that area and establishment of a satisfactory health status, the Accredited Area reverts to a Restricted Area.

Accredited Areas are retested as rapidly as possible, preferably before they become outdated. In recent years priority has been given to initial testing of new areas, particularly areas where the cattle population is dense, in order to seek out and eradicate mass infections, particularly in districts where dairy-type cattle predominate. As the cattle in all such areas have now been tuberculin tested at least once, under the Restricted Area plan and all reactor cattle removed and slaughtered, we are quite sure the infection remaining in these areas will be comparatively negligible. This view is supported by the low incidence of tuberculosis disclosed by retesting operations in those areas.

It is pointed out here, that retesting of areas for the purpose of re-accreditation is steadily going forward. At this date, August 1st, 1950, there are a considerable number of new areas almost ready for accreditation. Out of 381 areas, 171 areas
comprising 2,707,000 cattle have accredited standing at this date. In the Restricted Area group, all the cattle in a number of these areas have necessarily been tested more than once to lower the incidence of tuberculosis sufficiently for accreditation. It is emphasized here that all cattle within an area are tested, whether the test is an initial area test, or retest.

The following table indicates the progress made under the Restricted Area plan during the period beginning April 1st, 1945, and ending August 1st, 1950

<table>
<thead>
<tr>
<th></th>
<th>TOTAL POPULATION</th>
<th>UNDER R. A. POLICY</th>
<th>UNDER ALL POLICIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 1/45</td>
<td>10,758,600</td>
<td>4,141,644 (38% of total)</td>
<td>4,793,731 (44.5% of total)</td>
</tr>
<tr>
<td>Aug. 1/50</td>
<td>9,081,300</td>
<td>5,453,931 (60% of total)</td>
<td>6,059,630 (66% of total)</td>
</tr>
</tbody>
</table>

These figures indicate that as of April 1st, 1945, 38.5 per cent of the total cattle population were being dealt with under the Restricted Area plan, with a further 6 per cent being dealt with under other plans, while as of August 1st, 1950, 60 per cent of the total cattle population were being dealt with under the Restricted Area plan, with a further 6.7 per cent were being dealt with under other plans. The drop in cattle population has had the effect of increasing these favorable percentages somewhat. However, it is evident also that the actual number of cattle being dealt with under the Restricted Area plan has increased 31.6 per cent.

The present policy is to concentrate all available forces on control measures under the Restricted Area plan, which now covers all inhabited territory east of the Great Lakes and almost all the organized territory of Manitoba. There is still a great deal of territory to be brought under control in Saskatchewan and Alberta. However, in these two Provinces practically all the more important dairying districts are dealt with under the Restricted Area plan. In these two Provinces the incidence of bovine tuberculosis is very low, negligible among the beef breeds. The entire Province of British Columbia is now being dealt with under the Restricted Area plan, with approximately 50 per cent of the cattle population being now of Accredited Area health status.

It will be seen that considerable progress has been made in controlling bovine tuberculosis in Canada during the past five years and we are confident that much greater progress will be made in the immediate future. However, we wish to make it quite clear that it is not the intention to jeopardize the quality of the work by increasing the quantity. It is our intention to adhere to the policy of retesting all cattle within an area before accreditation of the area expires and, while provision is made in the regulations for the extension of accreditation of an area, where there is no reason to assume the incidence of tuberculosis is greater than when it was accredited, this prerogative has not been used since the war, nor is it presently the intention to extend accreditation of any area beyond normal limits.

The originators of tuberculosis control in Canada provided, through the Restricted Area plan, a sound foundation upon which it is possible to move forward
toward complete eradication of bovine tuberculosis. During the years of the 2nd World War the work of bovine tuberculosis control in Canada was of necessity curtailed somewhat, however, the Canadian livestock industry and the public generally are keenly aware of the importance of this work, so much so that we have found it quite impossible during the past few years to satisfy the demands received for service of this nature with the veterinary staff at our disposal.

During the fiscal year ended March 31st, 1950, 2,571,587 cattle were tested with tuberculin; among this number 31,464 or 1.22 per cent tuberculous animals were discovered and slaughtered under departmental veterinary supervision. Of these, the number of carcasses condemned as unfit for food purposes were 3,214 or 10.2 per cent, the number of non-lesion carcasses was 8,922 or 28.3 per cent.

Approximately 90 per cent of reactor cattle, discovered during the past fiscal year was found in areas of dense cattle population in Eastern Canada which were undergoing the initial test under the Restricted Area plan.
STUDIES OF TUBERCULIN

I. THE COMPARISON OF VARIOUS TYPES OF TUBERCULIN TESTS ON REACTOR CATTLE

B. C. SWINDLE, D.V.M. AND L. A. BAISDEN, Ph.D.*
HOWARD W. JOHNSON, B.S., M.S., D.V.M., AND R. R. HENLEY

Tuberculin, as a diagnostic agent, was first suggested by Dr. Robert Koch (1) in 1890, and between 1890 and 1892 studies of its value for this purpose were begun by Drs. Theobald Smith and E. A. de Schweinitz (2) of the Bureau of Animal Industry. It was first used in the United States for the diagnosis of tuberculosis of cattle in March, 1892, by Dr. Leonard Pearson, the distinguished veterinarian of the State of Pennsylvania, and by 1893 it was being produced in large quantities by the Bureau of Animal Industry for distribution to federal officials for use in their work and also to state, county and municipal officials on the condition that they supply the Bureau with records of all tests and autopsies.

The demand for tuberculin increased steadily until in the year ended June 30, 1906, 103,510 doses of subcutaneous tuberculin were distributed by the Bureau. By 1917 its value as a diagnostic agent was so well established that a country-wide campaign was begun to eradicate tuberculosis from cattle, based upon the reliability of the tuberculin test.

Until 1918 the tuberculin produced by the Bureau was always of the form used for the subcutaneous test. The time and labor required for that test led in 1918 to the adoption, after extensive preliminary surveys, of two other tests, the intradermic and ophthalmic. The three tests, intradermic, ophthalmic and subcutaneous, continued in use until 1934 when, based on field experience, the intradermic test was selected as the most practical and most dependable for general field use. Since that time the intradermic test applied to the caudal fold or vulva has been the only test regularly used in field work and by its use tuberculosis in cattle has been steadily reduced to its present low level of less than 0.2 per cent of reactors among the more than eight million cattle tested in 1949.

As the disease was eradicated, difficulties that had been present from the beginning of the work but which has been considered of slight importance began to assume more and more prominence. The chief of these difficulties were (1) no-visible-lesion cases, or reactors in which lesions were not found and (2) problem herds, or herds from which tuberculosis was not eradicated by repeated testing.

Two methods of attack on these problems were suggested: (1) To improve the tuberculin or make it more potent and more specific and (2) to evaluate methods of testing with the view of developing new techniques, or improving old ones. This section of the paper reports the results of an investigation of methods of testing: Section II reports the effects of prior injections of tuberculin upon the sensitivity

* United States Department of Agriculture, Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, Beltsville, Maryland, and Washington, D. C.
of reactor cattle. Section III reports the results of application in the field of the cervical test for tuberculosis.

The work was begun in May 1947, when a group of federal veterinarians from different sections of the United States were detailed to the Animal Disease Station, Pathological Division at Beltsville, Maryland, to participate in a series of experimental comparative tuberculin tests. The tests were carried out under the supervision of the Pathological Division in cooperation with the Brucellosis and Tuberculosis Eradication Division of the United States Bureau of Animal Industry.

**Experimental**

The object of the experiments was to determine the relative merits of various tuberculin tests in detecting tuberculous cattle by comparing the results of each test with the results of post-mortem findings. The tests used were: A. intradermic cervical; B. intradermic caudal; C. intradermic vulva; D. ophthalmic; E. Stormont; and F. subcutaneous.

The cattle used in this experiment were 60 tuberculin reactors, mostly dairy type, taken from ten herds on routine field test in New York State and brought to Beltsville, Maryland, for study. Each of fifty animals was given 10 cc. of intradermic tuberculin subcutaneously and ten were used as controls in the experiment to determine the effect of a subcutaneous injection of tuberculin on subsequent intradermic test.

Table I shows the herd histories of the reactors.

The cattle were shipped to Beltsville in both railroad cars and trucks, the last shipment being received May 24, 1946. Upon arrival they were housed in three barns in box stalls, fed routine diet twice daily, exercised in small lots and milked when necessary. Care and handling were as nearly normal as could be under the conditions.

After holding a period of at least two days, each animal was serially branded on the left hip, injection sites of three inches square were clipped and skin readings

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**Table I. Herd Histories of Reactors**

<table>
<thead>
<tr>
<th>HERD NUMBER</th>
<th>NUMBER OF TESTS</th>
<th>NUMBER OF TRAILS TESTED</th>
<th>NUMBER OF TESTS SHOWING INFECTION</th>
<th>LAST TEST DATE</th>
<th>NUMBER TESTED</th>
<th>NUMBER OF REACTORS</th>
<th>NUMBER SENT TO BELTSVILLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>12</td>
<td>7</td>
<td>4-25-47</td>
<td>41</td>
<td>34</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>23</td>
<td>1</td>
<td>4-21-47</td>
<td>123</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>24</td>
<td>19</td>
<td>5-6-47</td>
<td>41</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>16</td>
<td>6</td>
<td>5-15-47</td>
<td>73</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>9</td>
<td>4</td>
<td>4-25-47</td>
<td>176</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>14</td>
<td>6</td>
<td>4-28-47</td>
<td>108</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>27</td>
<td>16</td>
<td>13</td>
<td>5-2-47</td>
<td>98</td>
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<td>2</td>
</tr>
<tr>
<td>8</td>
<td>19</td>
<td>16</td>
<td>7</td>
<td>5-5-47</td>
<td>80</td>
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<td>2</td>
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<tr>
<td>9</td>
<td>19</td>
<td>14</td>
<td>8</td>
<td>4-30-47</td>
<td>84</td>
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<td>1</td>
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<td>14</td>
<td>5</td>
<td>3-27-47</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
were made in millimeters with the dermal thickness gauge of Kummer and Johnson (3). Between May 27 and early in July, the cattle were submitted to an extensive series of tuberculin tests with BAI tuberculins and johnins. On July 16 they were shipped to Baltimore, Maryland and slaughtered under the supervision of a U. S. Government meat inspector.

The post-mortem results revealed 28 visible lesion cases, two skin lesion cases and 30 no-visible-lesion cases as shown in Table III.

Operators

Each of the seven veterinarians who took part in the work was particularly qualified to conduct one or more tests and was responsible for the application and interpretation of the tests in which he had specialized. Brief descriptions of the manner of conducting and interpreting the tests follow:

Intradermic Cervical Test

On May 27, each animal was injected with both BAI mammalian intradermic tuberculin and BAI intradermic johnin in two each of the prepared cervical areas. The injections were made with 1 cc. long-barrelled glass syringes, 26-gauge needles, \( \frac{3}{4} \) inches in length. All injections were made in 0.2 cc. amounts. Readings, or measurements of skin thickness, were made previous to the injections and at desired intervals thereafter with the dermal thickness gauge. The readings were made at 48, 72, 96, and 120 hours after the tuberculin injections and at 48 and 72 hours after the johnin injections.

The results are shown in Tables II and III. Table II shows the total increase on all cows and the average increase in mm. thickness for both the tuberculin and johnin tests. These values show that the maximum tuberculin reactions were reached at about the 48th hour and declined thereafter. In no case was the so-called "delayed reaction" at the 96th or 120th hour detected. The johnin readings were made only at the 48th and 72nd hour and no significant differences were noted. Table III shows the results of the intradermic cervical tests based on interpretations of the 48-hour readings. Reactions of less than 2 mm. increase were regarded as negative; between 2 mm. and 3 mm. increase, as suspicious; and 3 mm. or greater increase, as positive.

Intradermic Caudal Fold Test

The left caudal fold of each animal was also injected on May 27 with 0.2 cc. of tuberculin and the right caudal fold with a like amount of johnin. All procedures and applications were identical to those used in the cervical test mentioned above, reactions of P-1, X-1, or greater, being regarded as positive.

Intradermic Vulva Test

The left side of the vulva of each animal was injected on May 27 with 0.2 cc. of tuberculin and the right side with an equal amount of johnin. All procedures and applications were the same as in previous tests. The interpretation was the same as in the caudal fold test.
STUDIES IN TUBERCULIN

Ophthalmic Test

During the course of the experiment there were three ophthalmic tests made, namely, on June 3, June 12, and July 3. Only the first two tests are recorded in Table III since there was very little difference in the last two tests. At 9 a.m. June 3, the sensitizing dose (approximately \( \frac{3}{10} \) cc.) of BAI Ophthalmic Tuberculin was installed in the left eye of each animal. On June 6 diagnostic doses were applied at 9 and 11 a.m. Four readings were made at two-hour intervals thereafter. A second test was made six days later, as stated above. The second test was made June 12 in the same manner as the first except that ophthalmic tuberculin discs were used instead of liquid tuberculin. The discs were of twice the regular strength. Classification of reactors was made by the veterinarian experienced in the use of the test according to routine procedures.

The Stormont Test

The Stormont test was developed at the Stormont Station, North Ireland by Kerr, Lamont and McGirr (4) and involves two intradermic injections in the same site. In applying this test the originators made the first injection in the cervical area. Exactly seven days following this injection the skin thickness at this site was measured and a second injection was made in the same site. The second injection was observed in 24 hours, and an increase in skin thickness of 5 millimeters or more (due to the second injection) constituted a specific reaction.

### Table II. Results of Pre-Subcutaneous Cervical Test of Experimental Animals

<table>
<thead>
<tr>
<th>TUBERCULIN</th>
<th>JOHNIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 Hr.</td>
<td>72 Hr.</td>
</tr>
<tr>
<td>(millimeters)</td>
<td>(millimeters)</td>
</tr>
<tr>
<td>Total Increase</td>
<td>653.7</td>
</tr>
<tr>
<td>Average</td>
<td>5.45</td>
</tr>
</tbody>
</table>

### Table III. Comparison of Various Tests with Post-mortem Findings*

<table>
<thead>
<tr>
<th>Test</th>
<th>+ TEST</th>
<th>- TEST</th>
<th>&quot;SUB-FECTED&quot; BY TEST</th>
<th>LESSION CASES MISSED</th>
<th>N.V.L. CASES REACTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ PM</td>
<td>- PM</td>
<td>TEST POSITIVE PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intradermic Cervical</td>
<td>26</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Stormont, 30-day</td>
<td>25</td>
<td>22</td>
<td>3</td>
<td>10</td>
<td></td>
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<tr>
<td>Intradermic Caudal</td>
<td>21</td>
<td>11</td>
<td>7</td>
<td>21</td>
<td></td>
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<tr>
<td>Stormont 7-day</td>
<td>19</td>
<td>27</td>
<td>9</td>
<td>5</td>
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<tr>
<td>Subcutaneous Test only on 50 cows</td>
<td>20</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Ophthalmic Test 2nd Test</td>
<td>15</td>
<td>27</td>
<td>13</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Intradermic Vulva</td>
<td>12</td>
<td>31</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ophthalmic Test 1st Test</td>
<td>6</td>
<td>31</td>
<td>4</td>
<td>18</td>
<td>1</td>
</tr>
</tbody>
</table>

* Post-mortem findings—28 lesion cases, 2 skin lesion cases and 30 no-visible-lesion cases.
The Stormont test used in this work differed from that just described, since some of the animals had received a previous injection of 10 cc. of tuberculin subcutaneously. Further, a 4 mm. increase following the second injection was considered positive, rather than the 5 mm. increase recommended by the originators.

Two of these tests were made—one seven days and one 30 days—after the subcutaneous injection. Since there was some evidence that the cattle were desensitized when the seven-day test was made, the test was repeated 30 days after the subcutaneous injection. The 30-day test gave excellent results, and for all practical purposes, could be called a true Stormont test since the animals had regained to a great extent their normal sensitivity. Doses of 0.2 cc. of mammalian intradermic tuberculin were used in both injections.

Subcutaneous Test

At 3 a.m. June 3, hourly pre-injection temperatures for the subcutaneous test began. At 9 a.m. 50 animals were injected subcutaneously in the flank area with 10 cc. of BAI mammalian intradermic tuberculin. This large dose was used to determine the effects of a large subcutaneous dose on a later intradermic injection. Post-injection temperatures were made hourly for a minimum of 14 hours or until all temperature curves were completed. Some of the animals gave general reactions to the large dose of tuberculin such as bloating and staggering.

Some of the intradermic sites previously injected showed a considerable increase in size for a short duration of time. The last temperature reading was made on these animals at 1 a.m. June 4.

A rise of 2 degrees F. or more above the maximum temperature observed prior to the injection of tuberculin or a temperature above 103.8 degrees F. was regarded as indicating a tuberculous infection provided the temperature reaction showed either the characteristic “rainbow” curve or the so-called “plateau”.

Animals which after injection showed a temperature rise of 2 degrees F. with a maximum between 103 and 103.8 F. as well as those which showed a rise in temperature of less than 2 degrees with a maximum temperature of 103.8 F. were regarded as suspicious.

Discussion

The efficacies of the various tests, the results of which are shown in Table III, may be compared in different ways according to the choice of the observer. For instance, if it is desired to compare the tests according to their ability to detect lesion cases, ignoring the non-visible-lesion cases (NVL's) with which each reacts, it can be seen that the cervical intradermic test the subcutaneous test, and the 4-mm.-30 day Stormont test are the most efficient and are not significantly different in this respect.

On the other hand, if NVL cases are considered and lesion cases ignored, the ophthalmic No. 2 and vulva intradermic each gave only one NVL case and were from that standpoint the most effective. However, those tests were obviously not dependable since each missed 16 or more lesion cases. With two exceptions, the seven and 30-day Stormont tests, NVL cases decreased as missed lesion cases increased. On the whole the results with the Stormont tests agree most closely with the results of the post-mortem findings.
In connection with agreement between results of these tests and post-mortem findings, it may be pointed out (1) that some of the NVL’s undoubtedly had obscured lesions of tuberculosis that were not detected, and (2) that all of the cattle used in this experiment had reacted in the field test to the intradermic caudal fold test, but in the retest seven lesion cases failed to react to that test. The failure to react to the second caudal fold test and also to other tests may have been due to desensitization. The cattle were retested in less than the time interval of 60 days recommended for retesting. About one quarter were retested within 30 days of the field test. However, the ability of a tuberculous cow to react is known to vary from one test to another, even at longer intervals than 60 days. This may be due to physiological reasons. For example, Miles and Long (5) found that the administration of thyroxine increased the ability of sensitized guinea pigs to react to tuberculin whereas cortisone or its stimulator, ACTH, decreased the ability to react. Further Lurie and coworkers (6) found that the administration of follicle hormone influenced the ability to react. Thus in this work, changes that occurred between the first and second tests in the physiological conditions of the animals may have been responsible for the variation of the results in the two tests.

Conclusions

On the basis of the results obtained in these retests of reactor animals it appears that (1) the results with the Stormont test suggests that it may be of value in problem herds that afford only NVL cases and therefore the test deserves further study; (2) that from the standpoint of the eradication program the intradermic caudal fold test is useful in detecting reactors in original field tests but that it may miss significant numbers of lesion cases on retests which the cervical test would detect; and (3) the intradermic cervical test should be of value in problem herds where repeated tests afford a number of lesion cases.

II. THE EFFECTS OF PRIOR INJECTIONS OF TUBERCULIN UPON THE SENSITIVITY OF REACTOR CATTLE

It has been a matter of general opinion that one intradermic test should not be administered too closely following a previous one in the same site. The Bureau of Animal Industry recommends that an interval of 60 to 90 days elapse between tests on the caudal fold.

Buxton and Glover (7) give a review of the literature previous to 1939 on the subject covered by this paper and in the same publication report the results of some experiments carried out on B.C.G. vaccinated animals. They conclude that no substantial effect on subsequent tests was evident following a single previous injection of tuberculin either subcutaneously or intradermically. However, unpublished work of Traum (8) has indicated that a subcutaneous injection of 5 to 10 cc. of intradermic strength tuberculin lowered the reactions resulting from concurrently or subsequently applied intradermic tuberculin tests. This effect was evident for at least a period of five days and seemed to be most evident in the cases in which the intradermic tests were made at about the same time as the subcutaneous injection.

In order to obtain more information on this point, it was thought advisable to study again the question of the effect of a tuberculin test on the sensitization of
reactor animals as measured by subsequent intradermic tests. The availability of a large number of reacting cattle upon which a subcutaneous tuberculin test had been carried out as reported in the preceding paper presented an excellent opportunity for further study of the question.

Experimental

As previously stated, 60 animals were injected intradermically in two sites on the left side of the cervical region, on one side of the caudal fold, and on one side of the vulva with 0.2 cc. of intradermic tuberculin on May 27, 1947. On the same date 0.2 cc. of intradermic johnin was injected in the corresponding sites on the opposite side of each animal. Fifty of the animals were injected subcutaneously with 10 cc. of tuberculin on June 3, leaving 10 animals uninjected in order to determine the effect of the initial intradermic tests upon the subsequent intradermic tests applied at different sites. Intradermic injections were made on new sites on all animals at the following times after the 50 animals were injected subcutaneously—12 hours, 24 hours, 72 hours, seven days, and 30 days.

Table I. The Effects of Tuberculin Injections upon Subsequent Intradermic Tests 50 Intradermically and Subcutaneously Injected Animals

<table>
<thead>
<tr>
<th>PRE-SUBCUTANEOUS</th>
<th>POST-SUBCUTANEOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-28-47</td>
<td></td>
</tr>
<tr>
<td>Average Increases</td>
<td></td>
</tr>
<tr>
<td>6.18</td>
<td>12 hour</td>
</tr>
<tr>
<td></td>
<td>6-3-47</td>
</tr>
<tr>
<td></td>
<td>24 hour</td>
</tr>
<tr>
<td></td>
<td>6-4-47</td>
</tr>
<tr>
<td></td>
<td>72 hour</td>
</tr>
<tr>
<td></td>
<td>6-5-47</td>
</tr>
<tr>
<td></td>
<td>7 day</td>
</tr>
<tr>
<td></td>
<td>6-10-47</td>
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<tr>
<td></td>
<td>30 day</td>
</tr>
<tr>
<td></td>
<td>7-1-47</td>
</tr>
<tr>
<td>Average Increases</td>
<td></td>
</tr>
<tr>
<td>4.91</td>
<td>2.67</td>
</tr>
<tr>
<td></td>
<td>3.73</td>
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<td></td>
<td>2.72</td>
</tr>
<tr>
<td></td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>4.38</td>
</tr>
</tbody>
</table>

Results

The averages of the 48-hour readings of the above-mentioned post-subcutaneous intradermic injections are shown in Table I in millimeter increases in skin thickness. Also included for comparison are the average increases obtained from the pre-subcutaneous cervical testing of the two groups of cows.

Of 42 pre-subcutaneously-positive cows as determined by an intradermic cervical test, 35 became negative within 72 hours, three became suspicious, and four remained positive, but displayed a lowered sensitization. Five cows which were originally suspicious became negative after the subcutaneous injection. In the group receiving no subcutaneous injection, but being tested at the same time as the above animals, six animals were positive on the initial test. Of these six, three became negative; one became suspicious and two remained positive but displayed a marked drop in sensitivity within 72 hours.

It can be seen that apparently partial desensitization resulted from the intradermic injection of tuberculin and johnin and that additional desensitization re-
resulted from the added effect of the subcutaneous injection of tuberculin. The eight simultaneous intradermic injections of 0.2 cc. amounts of tuberculin and johnin on May 27, 1947, before the subcutaneous injection, furnished an amount of allergen equal, or nearly equal, to the dose recommended for the subcutaneous test. This amount was probably sufficient to partially de-sensitize to the intradermic test after a period of six to 14 days. By the end of 30 days, the cattle in both groups had largely regained their sensitivity. Good evidence for re-gain of normal sensitivity was shown by some cows at the end of seven days following the subcutaneous injection.

Summary

Sixty cattle were each given eight intradermic injections and divided into two groups. One group of 50 animals was given a subcutaneous injection of 10 cc. of intradermic tuberculin; the other group of 10 animals was untreated. Twelve, 24, and 72 hours, 7 days and 30 days after the subcutaneous injection was given to the 50 animals, intradermic tests were carried out on previously unused neck sites of all animals.

The reactions from these post-subcutaneous tests were in all cases smaller than the reactions obtained in the first test. The reactions were smaller in the group receiving the subcutaneous injection in addition to the first eight intradermic injections than in the group receiving only the intradermic injections. By the 30th day the reactions were almost as large as the original reactions indicating that there had been a loss of sensitivity within that period. The results indicate that a prior injection of relatively large doses of tuberculin either intradermically or subcutaneously may cause desensitization, the effects of the subcutaneous injection in this case being the most pronounced.

III. RESULTS OF THE APPLICATION IN THE FIELD OF THE CERVICAL TEST FOR TUBERCULOSIS

As a result of the experiments mentioned in a preceding paper the cervical test for tuberculosis was adopted in the Tuberculosis Eradication Program for use in problem herds. During the period in which it has been used the merits of the test have been discussed pro and con by veterinarians and herd owners. However, no report of results of its application has been published. Recently it was suggested that the data obtained in field tests be compiled and an attempt made to evaluate the merits of this test. This paper is the result and presents data obtained from Federal Inspectors in Charge of seven States where the greater part of cervical testing has been carried out.

The data do not include results of caudal fold testing. Such results would be desirable in order to compare the two tests. Since this information is not available the cervical results will be compared with the post-mortem findings. Results can also be evaluated on the basis of the herd histories and past experience in clearing up problem herd infections by the use of other tests.

The data are based on results obtained in 85 herds containing 6262 cattle. In compiling information on such a large number of herds many variations in testing procedures were encountered. The most important of these were: Some herds were
repeatedly tested, others were tested only once. In some herds the cervical test was used until the herd was accredited, while in others it was used only once and the caudal test was used subsequently; in some herds the cervical test was employed as many as nine times and in others only once; in four herds the cervical was the last test used.

Preliminary analyses of the results of the herds as a whole indicated that they could be divided into three definite types according to the amount of infection present as indicated by herd histories and post-mortem findings. Detailed descriptions and comments on the three types follow:

**Type I**

The herds in this type are those of the "problem type" and have had persistent infection over a period of years, or a "herd break," either of which would warrant the use of the cervical test. They contained 4161 cattle. A great number of these herds had never been accredited before the use of the cervical test while 18 have been accredited since using the test.

On the first cervical test of the Type I herds there was 18.8 per cent infection with over 50 per cent reactors showing lesions on post-mortem. Fifty-three lesion cases were generalized or 6.76 per cent of the total number of reactors. On the second test (cervical was employed in 23 of the 49 herds) the percentage of reactors had dropped to 2.24 with 2.50 per cent being generalized and 42.50 per cent localized lesion cases. The interval between the first cervical and second test was 90 days with the exception of eight herds. Seven of the eight were retested within five months, and one within nine months. On the final test the number of reactors had dropped to 16 or 0.431 per cent, with no generalized cases, 37.50 per cent local lesions, 12.50 per cent skin lesion reactors and 50.00 per cent no-visible-lesion cases.

The herd history and test results of one Type I herd are of particular interest. Over a period of 39 months the herd was subjected to eight caudal fold tests, and a cervical test, or nine in all.

During the 39 months 264 reactors were taken with 208 showing lesions on autopsy of which 98 were generalized cases. When tested cervically the herd consisted of 100 head; 55 reactors were taken, 14 showing local lesions and three showing generalized tuberculosis. The remaining non-reacting cattle (45) were slaughtered and no lesions of tuberculosis were found on autopsy.

Results of tests of all herds are shown in Table I.

**Type II**

Herds classified in Type II are those containing moderate infection. They contained 1336 cattle. In this class of herds, on the first cervical test there were 63 reactors or 4.71 per cent. Of these one was a generalized case (1.58 per cent), 24 were local lesion cases (38 per cent), 1 was a skin lesion case (1.58 per cent) and 37 were no-visible-lesion cases (58.72 per cent). On the second test eight of the 18 herds were cervically retested. Thirteen of the 18 were retested within 90 days while three were retested in four months and the remaining two in six months. Only two reactors were found on the second test, both being no-visible-lesion cases. The final test revealed one reactor (0.81 per cent of cattle tested) which showed local
### Table I. Results of Cervical Tests of Cattle in Herds of Different Types

<table>
<thead>
<tr>
<th>Type Number</th>
<th>Number Tested</th>
<th>Reactors</th>
<th>Results of Post-mortem Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>Generalised Lesions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Per Cent</td>
<td>No.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>*I. 49 herds, 1st Cervical</td>
<td>4,161</td>
<td>784</td>
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<td></td>
<td></td>
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<tr>
<td>2nd Test</td>
<td>3,564</td>
<td>80</td>
<td>2.24</td>
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<tr>
<td>Last Test</td>
<td>3,708</td>
<td>16</td>
<td>3.43</td>
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<tr>
<td>†II. 18 herds, 1st Cervical</td>
<td>1,336</td>
<td>63</td>
<td>4.71</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>2nd Test</td>
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<td>1.18</td>
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<td>Last Test</td>
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<td></td>
</tr>
<tr>
<td>†III. 18 herds, 1st Cervical</td>
<td>765</td>
<td>22</td>
<td>2.87</td>
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<tr>
<td>2nd Test</td>
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<tr>
<td>Last Test</td>
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<td>0</td>
<td>0.00</td>
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</table>

* Herds containing rather heavy or persistent infection.
† Herds containing moderate infection.
‡ Herds containing no proved infection.
lesions on post-mortem. Five of the herds have been accredited. Sufficient time has not elapsed for the others to be accredited.

**Type III**

This group is made up of herds containing no proved infection and under usual conditions would never have been cervically tested. They contained 765 cattle. Some of them were tested cervically on routine tests for unknown reasons, others were cervically tested because of suspicious reactions of some individuals to the caudal test, while still others contained cattle that has been exposed to infected herds. There were 22 reactors to the first cervical test of which two were no-visible-lesion cases and one a skin lesion case. The second and last test were negative.

**Discussion**

As indicated in the results of herds classified as Type I the cervical test is of value in detecting tuberculous cattle in heavily infected herds and particularly in problem herds. In all three types of herds a great drop in the percentage of reactors is noted between the first cervical and the second test which in most cases was within 90 days after the cervical. It should always be kept in mind that the cervical test is to be used only in known infected herds where lesion cases have been taken previously by the caudal test. Results on the herds in the Type III classification makes this point clear,—under usual conditions, these herds would not be tested, but were tested and afforded twenty-two reactors and no lesions of tuberculosis found. It should be emphasized that the cervical test is no more specific than the caudal test, but according to previous experiments the results of which are to be published later it is approximately three times as sensitive. To employ it on herds where no tuberculosis exists will only cause more no-visible-lesion reactors.

**Conclusions**

1. The cervical test is of particular value in detecting tuberculosis in known infected herds and its use should be limited to such herds.
2. In employing the cervical test it is likely that a greater number of no-visible-lesion reactors will result than when employing the caudal test, but at the same time a greater number of lesion cases will be detected.

**Acknowledgement**

We wish to acknowledge the assistance of the following Bureau veterinarians: Charles A. Turner, William A. Nusser, William Rosner, William C. Logan, and Lewis J. Pate, who aided in carrying out the experiment.

**REFERENCES**

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<th>Reference</th>
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<th>Title</th>
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</tr>
</thead>
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<tr>
<td>8.</td>
<td>Traum, J.</td>
<td>Report to Pathological Division, B.A.I., for fiscal year July 1934, to June 1935.</td>
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</tr>
</tbody>
</table>
In reporting on bovine tuberculosis eradication this year, I am impressed with the fact that action taken by the United States Livestock Sanitary Association at the October 1949 meeting held in Columbus, Ohio, will aid greatly in reviving interest in this project. There has been very little change in the percentage of tuberculous animals reported for the entire country during the past eight years; in fact, it will be slightly higher in 1950 than it was in 1943. Prior to that time, there was an almost unbroken decrease in the percentage of infection since the inception of the project in 1917.

I think all will agree that the consistent and effective support given this project by the Association through the years has greatly strengthened the eradication program and given the livestock industry of this country more prestige in other countries. The years required to reach our present low percentage of bovine tuberculosis seem rather long to many people; however, to the careful observer, the accomplishment could very well be considered as one of the most outstanding in our generation so far as public health and economy in livestock production are concerned. The contribution to our fund of knowledge made by a number of the states through research and its practical application in the field cannot be overestimated. In some major livestock producing countries, 25 to 50 per cent of the cattle are tuberculous and thousands of new cases of the bovine type of the disease in man are being reported annually in those countries. In this country the bovine type of tuberculosis in man is becoming very rare.

The one point which we are most anxious about is reaching the goal of eliminating the last infected animal. Changes in procedures recommended last year by the Association, which have been approved by the Bureau, will undoubtedly aid greatly in reaching this goal. These recommendations provide for testing all except range and semi-range cattle at intervals not to exceed six years, in order for the area to qualify for recertification as tuberculosis free. Many people who are keenly interested in this project have interpreted this change to represent a relaxing of requirements for testing. This fear is due, I am sure, to lack of appreciation of the fact that, subsequent to the original accrediting tuberculin testing, recertification in a large number of counties has been achieved on the basis of spot-testing at three year intervals. In some instances this spot-testing has amounted to not more than one or two per cent of the total cattle population in the county and in some instances this small percentage of cattle tested is made up of the same herds which were tested for previous recertification purposes. Under the new arrangement all cattle except range and semi-range will be tested at not to exceed six-year intervals in those areas where there was an appreciable amount of bovine tuberculosis on the orig-

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1 Dr. Kuttler is In Charge of the Brucellosis and Tuberculosis Eradication Division, Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.
inal or any subsequent test. It should also be kept in mind that there is nothing in this change which will prevent or discourage more frequent testing in areas where those in charge of the tuberculosis eradication work feel it should be done. Under present conditions in many areas, annual testing of dairy herds is required.

In addition to the greatly increased amount of testing which will be required beginning January of next year, careful consideration should be given to improving methods of locating infected herds by other means available to us. When an infected herd is found, greater care should be exercised so as to prevent the spread of infection from the herd. There can be no question about the importance of increasing vigilance in areas originally found to have a high percentage of bovine tuberculosis. However, to increase greatly the volume of tuberculin testing where little or no tuberculosis was revealed on the original test and where there is no evidence in slaughter reports that the disease is being found, will result in some opposition. It is incumbent upon all who are interested in this project to do everything possible to combat the attitude of complacency with regard to the test, which is still our best method of locating diseased herds. Veterinarians and owners alike should appreciate the fact that something which has become very scarce is more difficult to find and will require closer attention than when the project was begun. Many reports received from the field indicate that during the past few years both the owners and the veterinarians agree that the test is made merely to comply with some regulation. This attitude, if not corrected, can prevent ultimate completion of the tuberculosis eradication project.

In dealing with other livestock diseases, it has been possible as the amount of infection has been reduced to also reduce the expense of the overall project; not so with bovine tuberculosis. When this project was begun, it was necessary to test approximately 25 cattle to find 1 infected animal. Now it is necessary to test approximately 20 times that number to find a tuberculous animal. For the last eight years, we have been testing approximately the same number of cattle each year. I am sure we can agree with the statisticians that by testing less than the number it took to reduce tuberculosis to its present less than 0.2 per cent, we cannot hope to do more than hold the ground gained if we fail to take advantage of additional opportunities available to us for identifying infected herds. A considerable increase in testing will make it necessary for us to call upon officials and producers to increase labor and expense unless we adopt other measures to assist in locating remaining infection and exercise greater caution with regard to restricting the movement of animals from herds known to be infected. A very large increase in the expense will not be well received by officials or owners and I am convinced that we should add to the tested and proved method of tuberculin testing an effort to trace back to the farm of origin more of the cattle found at slaughter points to be tuberculous than is possible at the present time.

Producers and consumers of food of animal origin have accepted federal meat inspection as a sound procedure in the interest of a more wholesome food and it appears that an increasing per cent of meat will be prepared under federal meat inspection. We should be prepared to take advantage of the opportunity afforded us through the use of records of tuberculous animals kept by the Meat Inspection Service. The expense should not be as great through cooperative effort as it is in
locating infected herds through our tuberculin testing operations alone. Many of us are not aware of the fact that less than 25 per cent of the cattle found tuberculous on post-mortem inspection by the Meat Inspection Service can be traced back to the farm of origin. The reason for this small percentage is that most of the cattle found to be tuberculous at the time of slaughter are not identified so they can be traced to the point of origin. As reported here this morning by Dr. Milo of Pennsylvania, some states, have recently taken steps to require that all cattle moving from farms to slaughter points be tagged, both in the interest of discouraging theft and of tracing to the farm or ranch of origin the cattle found on post-mortem examination to be tuberculous. Such identification would, of course, be helpful in dealing with all infectious and contagious diseases of livestock. The Federal Meat Inspection Service has through the years been one of our greatest aids by assisting in tracing to the farm of origin animals found to be tuberculous at slaughter plants where this service is maintained. Arrangements have been made to use a special report for the information of state and federal regulatory officials.

It is recognized everywhere that popular support for completion of the bovine tuberculosis eradication project has continued to increase until the present time. However, there are still a few states where adequate legislation and appropriations are lacking. With changes in our marketing procedures and methods of transportation, adjustments in laws and regulations will be required. The basic provision in all livestock disease eradication projects of locating the diseased animal and preventing it from circulating in the channels of trade for purposes other than immediate slaughter is even more important now than it was when this project was begun, since it is reasonable to suppose that with the reduction of infection, susceptibility has to some extent increased. If we are to reach our goal in bovine tuberculosis eradication, we shall have to adjust our methods so as to provide better supervision of movements of cattle. Former successes in livestock disease eradication can be attributed, among other advantages which we have enjoyed, to more efficient control of the movements of diseased animals than we are now able to maintain, with the introduction of modern methods of transportation.

Statistical data accumulated from the beginning of this project have again been prepared in the Bureau office and copies are available to you at the speaker’s table. Should you desire additional copies, you may secure them by writing the Bureau office in Washington.

There were 9,439,811 cattle tuberculin tested by the Bureau and the cooperating states during the fiscal year ending June 30, 1950, with 17,733 reactors, or 0.19 per cent.

**SUMMARY, BOVINE TUBERCULOSIS ERADICATION**

1. All who have in any way participated in the bovine tuberculosis eradication project and especially the veterinary profession, have aided in strengthening the eradication program which has gained the recognition of producers and consumers of food of animal origin and those interested in public health, not only in this country but in all major livestock producing countries.

2. It will require renewed interest and effort to reach the ultimate goal. Increased tuberculin testing and information which can be furnished by the Meat Inspection
Service provided cattle are properly identified at the time of sale are still the best methods of approach.

3. The need for combating the tendency to lose interest and also the need to search even more diligently than during the early years for diseased animals should be apparent to all.

**AVIAN AND SWINE TUBERCULOSIS ERADICATION**

Avian tuberculosis surveys are being continued in nine Midwestern states, with emphasis on education rather than on repeated survey tests in areas where the incidence of the disease has been well established. There has been no change in stressing that the key to the solution of avian tuberculosis eradication is the maintenance of all-pullet flocks under good sanitary conditions, where production is for food purposes. This system of management aids also in the control of other poultry disease. In breeding flocks, which represent only a small percentage of the poultry flocks in the country, a tuberculin test should be used regularly if the birds are kept for more than one laying year.

Swine are susceptible to both avian and bovine tuberculosis. With the low incidence of tuberculosis in cattle, danger from this source is not too great. When the disease is controlled in poultry, the problem in swine will automatically diminish.

**PARATUBERCULOSIS**

Research on paratuberculosis is being continued at the Bureau Regional Laboratory at Auburn, Alabama. Such research is also being extended to the field and in a limited way is resulting in eliminating reactors from herds in connection with the bovine tuberculosis eradication project.
REPORT OF THE COMMITTEE ON TUBERCULOSIS


At the request of several states, your Tuberculosis Committee has given serious consideration to the report of the 1949 Committee and are recommending certain changes, namely a revision of paragraph 17 and the addition of 17(a) to Part II and also elimination of paragraph 21. Uniform Methods and Rules for the Establishment and Maintenance of Accredited Tuberculosis Free Herds of Cattle and Modified Accredited Areas would therefore read as follows:

UNIFORM METHODS AND RULES FOR THE ESTABLISHMENT AND MAINTENANCE OF TUBERCULOSIS-FREE ACCREDITED HERDS OF CATTLE AND MODIFIED ACCREDITED AREAS

Part I.

Individual Accredited Herd Plan

1. (a) A tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two (2) negative, successful annual physical examinations and tuberculin tests. Herds in which infection occurs shall be quarantined and shall be required to pass three (3) negative tuberculin tests not less than 60 days apart to lift quarantine; and further, such herds shall not be accredited until they shall have passed a tuberculin test without evidence of reaction, not less than 12 or more than 14 months following the test on which infection was disclosed; such physical examinations and tuberculin tests shall be applied by an accredited veterinarian or by a veterinarian regularly employed by the state or United States Bureau of Animal Industry.

   (b) When an accredited herd or a herd in the process of accreditation is to be tested at the expense of the owner or by an accredited veterinarian, the following regulations are to be observed:

   (1) The tuberculin tests shall be applied on dates approved by either the state livestock sanitary official or the inspector in charge of the Bureau of Animal Industry, or both, in the state wherein the herd is located.

   (2) The accredited veterinarian shall not conduct such tests until after he has received written authorization from the proper cooperating state or bureau officials.

   (3) The accredited veterinarian shall submit a report of such tests in accordance with the regulations of the cooperating state and federal authorities. These officials reserve the right to supervise any tests conducted by an accredited veterinarian.

2. The Tuberculin Test:

   (a) The official test shall be the intradermic or the subcutaneous test. The intradermic injection shall be a measured amount of tuberculin, not less than one-
tenth (1/10) of a cc. for routine testing, nor more than two-tenths (2/10) of a cc. for testing known infected herds, when intradermic injections are made in the caudal, cervical or vulva areas. The intradermic injection of tuberculin in the cervical area in herds in which infection occurs may be used only when approved by state and/or federal cooperating officials.

(b) State and federal authorities may require that any herd in which infection has been found shall not become accredited unless the final or accrediting test has been made by a combination of either the subcutaneous and intradermic applied in the caudal fold, or by the double intradermic caudal fold and vulva injection, or by a combination of either subcutaneous, intradermic caudal fold or vulva with intradermic injection in the cervical areas.

(c) The veterinarian who applied the tuberculin test shall inform all cattle owners concerning tuberculosis of other domestic animals, including poultry and swine.

3. The entire herd, or any cattle in the herd, shall be tuberculin tested or retested at such times as deemed advisable by the cooperating state and federal authorities.

4. No animal shall be presented for the tuberculin test which has been designated as a reactor at any time.

5. Reactors to the tuberculin test shall be promptly removed from the farm and after their removal, the infected premises shall be thoroughly cleaned and disinfected with a disinfectant approved by the United States Bureau of Animal Industry and in a manner satisfactory to the cooperating state and federal authorities. The following information should be included in the report of the veterinarian making the test.

- Past history of herd
- Water supply
- Light
- Ventilation
- Sanitation
- Management
- Manner of making additions to the herd
- a—source, b—isolation pending retest, c—retests
- Disposal of waste products
- Human infections
- Avian infection

6. Herd owners are required to house, feed and care for the cattle under such sanitary conditions as will tend to promote good health and to follow such recommendations as are made by the cooperating state or federal authorities.

7. Calves in accredited herds shall not be fed milk or other dairy products from other herds not fully accredited, or from unknown sources, unless such materials have been properly pasteurized.

8. Herd Records:

(a) The herd owner is required to establish satisfactory evidence of the identity of each registered or grade animal, the grade animal to be marked by a tag or other marking satisfactory to the cooperating state and federal authorities.

(b) Each herd owner is required to keep a record of all additions and removals of cattle from the herd by sale, death or slaughter.
9. All vehicles shall be cleaned and disinfected before they are used for transporting cattle to herds maintained under this plan.

10. Added Cattle: Herd additions must originate in tuberculosis-free accredited herds or in herds of comparable status in a modified accredited area.

11. Accredited herd certificates may be issued by the cooperating state and federal authorities and shall be valid for one year unless revoked.

12. Failure on the part of an owner to comply with these methods and rules shall constitute sufficient cause for the revocation of the accredited herd certificate.

Part II.

*Modified Accredited Area Plan*

13. The provisions of the Individual Accredited Herd Plan that relate to testing, removal of reactors, cleaning, disinfecting and sanitation, shall apply to the Modified Accredited Area Plan. All infected herds shall be quarantined and tested as provided in paragraph 1.

14. If, as the result of one complete tuberculin test within the designated area, the total number of reactors is less than one-half ($\frac{1}{2}$) of one (1) per cent of all the cattle within the area, *the area may then be declared an official modified tuberculosis-free accredited area for a period of three years by the cooperating state and federal officials. Infected herds shall be quarantined and tested as provided in Paragraph 1.*

15. If, as a result of a complete tuberculin test of all the cattle within the area, *the number of reactors is one-half ($\frac{1}{2}$) of one (1) per cent and not more than one (1) per cent, the infected herds shall be quarantined and retested. If the total number of reactors found as a result of this retest within the area is less than one-half ($\frac{1}{2}$) of one (1) per cent of the entire cattle population within the area, the area may then be declared an official modified accredited area for a period of three years. All infected herds shall be quarantined and tested as provided in Paragraph 1.*

16. If, as a result of one complete tuberculin test of all the cattle within an area, *the total number of reactors exceeds one (1) per cent, all the cattle in the area shall be retested.*

17. Modified accredited areas which disclosed on the original or any subsequent test a degree of infection of (0.2) of one (1) per cent or higher, in which a complete area retest of all the cattle* in said area indicates a degree of infection not exceeding (0.2) of one (1) per cent may remain in the modified accredited status for a period of six years from date of reaccreditation, provided that in calculating the degree of infection all post-mortem meat inspection reports of tuberculosis accumulated for said area since the last accreditation test are included, provided further that adequate state laws and/or regulations exist which will permit effective quarantine and testing of all infected herds, as provided in paragraph 1, are enforced.†

* Exception as hereinafter provided in paragraph 22.

† It is not intended that reaccreditation tests as provided under paragraphs 17 and 17(a) should interfere with more frequent tests when state and federal cooperating Officials consider such additional testing necessary.
17. (a) Modified accredited areas which disclosed on the original or any subsequent test a degree of infection less than (0.2) of one (1) per cent in which a test of ten or more per cent of the cattle* in the said area discloses a degree of infection not exceeding (0.2) of one (1) per cent may remain in the modified accredited status for a period of six years from date of accreditation, provided that in calculating the degree of infection all post-mortem meat inspection reports of tuberculosis accumulated for said area since the last accreditation test are included provided further that adequate state laws and/or regulations exist which will permit effective quarantine and testing of all infected herds, as provided in paragraph 1, are enforced.†

18. Modified accredited areas in which on the original tuberculin test of all cattle* in said areas the extent of infection did not exceed one-half (½) of one (1) per cent, may be reaccredited (and also modified accredited areas that have been reaccredited in which on the last complete tuberculin test of all the cattle in said areas the extent of infection did not exceed one-half (½) of one (1) per cent may be reaccredited) if not more than one-half (½) of one (1) per cent react as the result of retesting all of the herds in which infection was disclosed at any time and such other herds as the state livestock sanitary officials and the federal inspector in charge may designate.

19. Modified accredited areas in which on the original test of all cattle in said areas* the extent of infection did not exceed two (2) per cent and also modified accredited areas that have been reaccredited, in which on the last complete tuberculin test of all the cattle in said areas the extent of infection exceeded one-half (½) of one (1) per cent and was less than one (1) per cent, may be reaccredited if less than one-half (½) of one (1) per cent of the cattle tested react as the result of retesting at least twenty (20) per cent of the total number of herds, in addition to all of the herds in which infection was disclosed at any time.

20. Modified accredited areas in which the degree of infection exceeded two (2) per cent on the original test may be reaccredited by retesting all the cattle in such areas in accordance with paragraphs 14 and 15.

21. It is recommended that these provisions become effective January 1, 1951.

22. A county or area may become a modified accredited area in the range or semi-range area upon compliance with paragraph (a) or (b) and other provisions in this section:

(a) When all bulls, purebred breeding cattle, milk cows, at least ten per cent of the semi-range breeding females and such other cattle as may be considered necessary by the state and federal department cooperating are tuberculin tested.

(b) When all bulls, purebred breeding cattle, milk cows, barnyard cows and home fed cattle are tuberculin tested and properly identified post-mortem reports are produced showing that at least ten per cent and not less than 25 animals of the breeding herd have been slaughtered within a year and that post-mortem examination failed to disclose lesions of tuberculosis.

If, under paragraph (a) or (b) of this section, a reactor or any other evidence of infection is revealed in any herd by post-mortem reports, etc., including post-mortem inspection at packing plants of those branded cattle that are sold direct from the range for immediate slaughter, then all of the cattle in that herd or associated with the diseased animal shall be immediately tuberculin tested in accordance with the provisions of the Modified Accredited Area Plan. The area may then be-
come a modified accredited area and be reaccredited at the expiration of three years, if the total number of reactors and cattle found tuberculous upon post-mortem examination from the area is not more than one-half ($\frac{1}{2}$) of one (1) per cent of all the cattle tested in the area.

23. The movement of cattle interstate under any and all conditions shall be subject to the approval of the proper livestock sanitary official of the state of destination.

Your Committee recommends that in the interest of completion of the bovine tuberculosis eradication project, discouraging theft and the control of all infectious diseases of cattle that state livestock sanitary officials consider enacting laws which will provide authority for requiring effective marking of cattle at the time they are moved from the farm or ranch, or at the time they are marketed, so that animals found to be diseased at marketing centers or slaughtering establishments can be traced back to point of origin.

The Committee further recommends for your consideration that all states give serious consideration to tracing infected animals, found at marketing centers by the inspectors, to source of origin and testing of all herds of which they have been a member.

The matter of proper training of newly accredited veterinarians in the correct technique of administering tuberculin and interpretation of results should be given serious consideration by the veterinary colleges and also by the state disease control officials when employing new men.

There apparently has not been much change in the number of reactors in the United States in the past year. However, there are a few localities in which there has been a noticeable increase in infection. These cases have been largely a problem for state control.

We have one problem, the matter of no visible lesion cases, which seems to be on the increase over the entire country. Considerable research is being done with this type of problem but to date, no outstanding recommendations have come forward. A large amount of research work has been done by the Federal Bureau with results that lend encouragement.

The matter of relationship between state and federal bureaus in the respective states may offer some solution to our problems in tuberculosis, in that it is rather noticeable that there is a lack of cooperative spirit between the two bureaus. Both units have an equal interest in the eradication of the disease and in states where both are active and have field forces they should be so coordinated that there is no duplication of effort and if such a workable relationship should exist a large amount of work may be done. It also may be true that in most all states tuberculosis infection has centered itself in a few localities. Where this condition exists an extensive effort should be made in those localities to clean up the infection where it is found; in this way combating its spread to clean herds and clean areas.

The proper application of the cervical test has much to offer in known infected herds. It picks out badly infected animals which are sometimes missed by the other tests. On the other hand, it offers the handicap of an increased percentage of no visible lesions. This, however, must be expected as it seems to be an accepted fact.
that the percentage of no visible lesions rises as the percentage of infection is reduced.

In many states the importation of Canadian cattle has presented some perplexing problems. Your chairman had an opportunity to meet with the Canadian authorities in charge of the Health of Animals Division, along with two Federal Bureau of Animal Industry representatives and is pleased to be able to report that the future of Canadian exports looks brighter. Canada has prosecuted a number of veterinarians and dealers. They are also expanding their tuberculosis and brucellosis programs in order to bring the entire country under official disease control in the near future.

There are four papers presented on the Friday morning program which offer a valuable amount of food for thought at this stage of the tuberculosis eradication program.
RECENT LITERATURE ON NEWCASTLE DISEASE

F. R. BEAUDETTE, D.V.M.

New Jersey Agricultural Experiment Station*, New Brunswick, New Jersey

INTRODUCTION

In 1943, the author reviewed the existing literature on Newcastle disease (Proc. Forty-Seventh Annual Meeting, U.S.L.S.A., 1943, pp. 122-177), and this review was added to by that of Brandly et al. in 1946 (Amer. Jour. Vet. Res., Vol. 7, No. 24, July, 1946, pp. 243-249). In a second review, the author (10) covered the literature that had accumulated between January 1948 and July, 1949. Thus, a complete review of the literature has been made except for the last half of 1946 and for 1947.

GEOGRAPHIC DISTRIBUTION

According to Berke and Golum (15) Newcastle disease (NCD) first appeared in Turkey in the spring of 1944, but originally was confused by practicing veterinarians with cholera, coryza and purulent enteroproventriculitis. The mortality was about 100 per cent. Near the end of that year the disease was thought by Vural to be fowl pest, but Golum drew attention to the respiratory and nervous symptoms. In absence of facilities for virus studies, the results of investigation did not appear till 1945. Eventually a virus that had the characteristics of NCD was isolated by egg inoculation. NCD virus for comparative study was obtained from the Institute of Pendik and from the Pasteur Institute of Paris. Sera immune to NCD and fowl plague as well as the corresponding viruses were obtained from Weybridge. As a result of the study it was concluded that the affection was NCD because fowls inoculated with virus from natural cases or virus cultivated in eggs from such cases gave the same symptoms and pathology as the disease caused by authentic English and French strains. Embryos inoculated with the native virus showed the same symptoms as those injected with authentic strains and had no resemblance to fowl plague. The native virus agglutinated red cells and agglutination was inhibited by NCD serum but not by fowl plague serum and serum from fowls immune to the native disease inhibited red cell agglutination by French and English strains.

Başkaya (16) also recorded that neither pest nor NCD existed in Turkey until 1944 and that the disease which appeared in 1944 was NCD as shown by serological tests made with serum and virus from the United States and Great Britain.

Up to this year NCD had been diagnosed on every continent and in nearly every country except Central and South America. The report of Divó (38) of the diagnosis of NCD in Venezuela is, therefore, of special interest. This outbreak occurred on a large broiler plant near Caracas and involved 15,943 birds. The loss between June 11, and July 2, 1949 was 9,878, or 62 per cent.

Introduction of the disease into the Netherlands was to be expected, in view of

* Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University—The State University of New Jersey, Department of Poultry Husbandry.

132
the proximity of this country to known infected countries, but, according to Jansen 
et al. (12) it was by way of a shipment of pheasants from Calcutta. The diagnosis 
was confirmed by isolation of the virus, its ability to hemagglutinate red cells and 
by inhibition tests. Infected material was destroyed by burning and disinfection 
with no further evidence of spread at the time of this report. Meanwhile, however, 
personal communication indicates that the disease is presently common.

Because of outbreaks in the Orkney Islands, Western Isles and especially on Bass 
Rock (inhabited only by lighthouse keepers) in relation to outbreaks on the main-
land, sea birds were suspected as a source of infection. Accordingly, Wilson (18) 
examined several specimens and recovered the virus from a gannet (Sula bassana) 
found on a beach at Saviskaill, Rousay, Orkney. A sterile suspension of bone mar-
row injected intramuscularly into a fowl resulted in classical symptoms and death 
in 9 days. In four additional passages typical symptoms were seen and virulence 
appeared to be enhanced as reflected in earlier death and hemorrhages in the pro-
ventriculus. The identity of the virus was confirmed at Weybridge.

**SPECIES AFFECTED**

A shipment of 50 pheasants by airplane from Calcutta to the Netherlands is 
credited with introducing the disease. Twenty-six of the birds were dead on arrival 
and the others died soon afterward according to Jansen et al. (12).

Although Wilson (18) recovered the virus from only 1 of 6 gannets examined, no 
 virus was isolated from 7 common gulls, 3 herring gulls, 1 black-backed gull, 3 
 black-headed gulls, 2 razor-bills, 1 tern, 3 cormorants, 1 puffin, 1 oyster catcher and 
 9 starlings. The infected gannet showed a severe nephritis with subcapsular petechia.

In the investigation of the cause of a duck disease on Long Island, the first virus 
isolated proved to be that of NCD, according to Levine and Fabricant (23). A sec-
ond isolation was made from the same farm later, but the virus isolated from other 
outbreaks was said to differ from that of NCD.

A 12-day-old nestling starling (Sturnus vulgaris) showing incoordination and 
tremor, but no respiratory symptoms, died and was examined June 17, 1949. Gil-
lespie et al. (25) found no gross lesions. They therefore made a 5cc. pool of brain, 
trachea and lungs, which was treated with 10,000 units of penicillin and 2500 units 
of streptomycin (incubated 1 hour), for the inoculation of 9, 9-day-old embryos 
with 0.4cc. each in the allantoic sac. As a result, 2 died in 3 days, 1 in 6 days, and 6 
were still alive after 6 days. Amnio-allantoic fluid of each of the embryos dead on 
the third day subinoculated into 6 eggs resulted in death in 2 days. In both passages 
the virus hemagglutinated and was inhibited by a positive serum, and second pas-
sage virus was neutralized by an immune NCD serum. It was presumed that the 
disease was brought to the nest by the parents, although neither was obtained for 
tests.

A news release (33) records that in a shipment of pheasants, quail, ducks and 
partridge from Hong Kong on March 16, 1950, all the partridge were dead on ar-
rival in California and that later the disease spread to the other species.

The susceptibility of pigs (30-75 pounds) and sheep has been investigated by 
Hofstad (30). The Iowa strain 125 was used and when cultivated in egg gave a titer 
of $20 \times 10^{-4}$. In serological tests sera were heated to 56°C for 30 minutes. A subcu-
taneous injection of 2cc., an intraperitoneal of 5cc. and an intravenous of 2cc. $10^{-1}$ caused no temperature reaction and the blood was negative for virus at 48 hours.

The first and last pigs showed no immune bodies at 4 and 3 weeks, respectively. Killed at 10 days, the intraperitoneally inoculated pig yielded no virus from liver, spleen, lungs, pancreas, lymph nodes, kidneys, blood or peritoneal fluid. A fourth pig, given 4 cc. intravenously and 0.5 cc. intracerebrally, showed virus in the blood at 6 but not at 9 or 24 hours. When this pig was killed on the 6th day, virus was recovered from the cerebrum, but not from spleen, liver or lung. A fifth pig similarly inoculated yielded virus only from the brain when killed on the 6th day.

Intracerebral and intravenous injections resulted in a serum that would not neutralize 100 doses of virus 33 days later when another intravenous injection was given which increased the titer to 100 neutralizing doses at 22 and 40 days and to 1,000 at 55 days. Nonheated serum apparently contains nonspecific neutralizing bodies, because a pig at 31 days after 3 intravenous injections neutralized 100,000 doses, but heated serum neutralized only 100 doses. In a series of intracerebrally inoculated pigs, death occurred in 3 to 11 days and virus was recovered only from the brain in 7 out of 10. Two attempts at a second passage failed.

Sheep, on the other hand, while resisting intravenous injection, showed a better antibody response. After brain inoculation, death occurred in 5 to 32 days, and virus was recovered from 6 of 8 examined.

Histological studies of brain sections of pigs and sheep failed to show the changes seen in chickens.

Berke and Golum (15) reported that a laboratory boy who tended chickens affected with NCD developed malaise; chills; headache; facial neuralgia of the left side; burning of the eyes, nose and throat; subconjunctival hemorrhage of the left eye and a subfebrile state, which lasted a week. Three weeks after recovery, a search was made for antibodies of influenza, brucellosis, NCD and fowl plague, but inhibition occurred only with a known NCD strain and the native virus. Sheehan (29) also described a case of presumed NCD in a 50-year-old poultry farmer whose flock was infected. The farmer developed severe pains, burning and reddening in both eyes with considerable swelling in the morning. There was considerable injection of both bulbar and palpebral conjunctivae, but no iritis. A smear showed numerous lymphocytes, but no bacteria. Almost immediate relief was reported from the use of aureomycin ophthalmic. A neighboring poultryman who developed a similar unilateral conjunctivitis also improved in a short time after the same treatment.

**MORPHOLOGY OF VIRUS**

Reagan et al. (35) used a 17th passage of a mouse-adapted strain to inject 10 mice, whose brains were pooled and prepared for electronic microscope studies. Sperm-like forms previously described in egg-propagated virus were seen to predominate in chromium-shadowed preparations. Nonshadowed material showed small segments in the tail.

**RESISTANCE OF VIRUS**

Beamer et al. (8) infected cotton pledgets, egg shell, glass coverslips, pieces of metal and wood with a $10^{-2}$ dilution of egg virus fluids and exposed these in incu-
RECENT LITERATURE ON NEWCASTLE DISEASE

Bators with and without formaldehyde fumigation using gas liberated from 17g. of potassium permanganate and 35cc. of formaldehyde per 100 cu. ft. In nonfumigated machines the virus was viable on all materials exposed for 2 to 24 hours, but fumigation destroyed the virus in one hour except on glass and wood placed in the bottom of the machine and on cotton whether placed at the top, middle or bottom.

In a second series, virus in the form of egg fluids, yolk, serosa and dried virus was exposed to 35 and 70cc. of formaldehyde for 2 or 3 hours. The 3-hour exposure with 70cc. destroyed all virus, as did one trial with 35cc. but in another trial the lyophilized material was not destroyed. The 2-hour exposure with 35cc., curiously enough, destroyed only the lyophilized. In an experiment designed to determine the shortest time required to kill virus (egg fluids) on various materials when exposed to fumigation with 35cc. of formaldehyde per 100 cu. ft., exposures up to 1½ hours were inadequate, but 2-hour exposures killed the virus except in one trial, in which virus on a cotton pledget exposed in the middle of the machine was still active.

Beamer and Prier (21) tested the efficacy of various chemicals by mixing 1cc. of \(10^{-4}\) virus dilution with an equal quantity of the disinfectants for exposures of 5 and 30 minutes, after which 1 to 10 and higher dilutions were made for inoculation into eggs in a dose of 0.1cc. each to determine activity of the virus. The following were effective after 5 and 30 minutes: liquor cresolis saponatis 1-400, formalin 2 per cent, Tr. iodine nondiluted and 1-100, Lugol's sol. 1-1000, NaOH 1-50, ethyl alcohol 70 per cent, potassium permanganate 1-100 and 1-1000, and merthiolate (1-1000) nondiluted. Phenol 1-50 was effective at 30 minutes and partly effective at 5 minutes. Formalin 0.5 per cent was effective at 30 minutes, but not at 5. Ethyl alcohol (50 per cent) was not effective at 5 minutes and partly effective at 30. Liquid green soap (1-10) was effective at 30 and partly effective at 5. Hydrogen peroxide (8 per cent) was partly effective at 5 and 30 minutes. These results are somewhat at variance with those reported by Cunningham, in that in these studies nondiluted Tr. of metaphen was not effective, but nondiluted merthiolate apparently destroyed the virus. The results are at variance with those reported by Tilley and Anderson in that phenol (1-50) and formalin at 2 per cent apparently inactivated virus in 30 minutes.

Schmittle and Mansfield (24) studied the efficacy of disinfection of a hatchery after an outbreak of NCD. After the hatchery was cleaned, strips of gauze 3 x 6 ft. wrung out of 10 per cent formaldehyde were draped over each brooder and hung in each incubator and hatcher. One and one-half gallons of 40 per cent formaldehyde were poured on the concrete floors of the brooder and incubator rooms (80 x 20 x 10 ft. each), one gallon on the show room floor (40 x 20 x 10 ft.) and one gallon in front of a fan of the forced draft ventilating system. Thus, about 5,500 cu. ft. were treated with 8 gals. of 40 per cent formaldehyde at a temperature of 100°F. and humidity of 100 per cent for 20 hours. Previous to the treatment, pieces of egg shell and pledgets of cotton infected with virus were exposed at selected positions. After exposure, they were put in saline to be inoculated into embryonated eggs—3 for each sample. In no case was virus recovered, but similar nonexposed material yielded virus. Efficacy was further shown by the fact that hatches for the next 4 months beginning 2 days after fumigation remained free of the disease.
In relation to heat, Hanson, according to Brandy (28), found that of 31 strains of virus all were infective after 15 minutes at 56°C. 3 became inactive after 30 minutes and 3 were still active after 3 hours exposure.

**Presence of virus in eggs**

Prier, Millen and Alberts (26) established the susceptibility of 10 flocks by hemagglutination-inhibition (HI) tests on 5 birds from each flock. After vaccination of the birds with live virus, 12 eggs were collected from each flock for 4 to 109 days. Of these, half were used for determining HI values of the yolk and half for yolk inoculation into embryonated eggs (10 days) for the detection of virus. No virus was recovered from the 192 eggs used. As early as 19 days, postvaccination HI bodies appeared in the yolk and persisted in one group to 109 days. Then 18 hens immunized against NCD with live virus, a combination of virus and serum, or serum alone were challenged with 1 cc of a 10⁻² dilution (100,000 embryo doses) at intervals of 9 to 22 days postimmunization. Of the 50 eggs examined, 19 were collected before, 1 on the day of, and 30 after the challenge. Virus was recovered in the eggs of only 3 hens and these were laid on the 4th, 5th and 5th days postvaccination and one of these was from a nonvaccinated contact hen. No virus was recovered from eggs after the resumption of production and none from eggs laid 1 to 26 days after the challenge.

**Survival of virus in poultry houses**

Hitchner (22) placed 12 chicks (7 weeks old) in a house that contained birds vaccinated intranasally 4½ months previously. After an exposure of 7 weeks no HI antibodies were demonstrable in 6 chicks tested, and on challenge 11 of the 12 developed paralysis.

Levine et al. (31) placed known susceptible chickens in flocks on 18 farms for exposure periods varying from 17 to 71 days. The flocks had recovered from symptoms of the natural disease 3 to 64 days before the introductions. No cleaning or disinfection had been carried out and the original diagnosis of NCD had been made by virus isolation, positive serum-neutralization (SN) or HI tests and by typical symptoms. The age of the recovered birds varied from a few weeks to 2 years and the experiments lasted from March 1947 to December 1948. Evidence of infection in the exposed chicks was determined by HI tests and in half the cases by challenge in the laboratory. Evidence of infection as a result of the exposure was found in only 3 cases, but in 2 of these, respiratory symptoms were still present in the donors. In the third case only 2 of 9 exposed birds took the disease from which the donors had recovered 17 days previously. Even in the 15 negative cases, birds with symptoms were seen in some flocks.

**Insect vectors**

Hofstad (7) established infestations of the feather mite Léonyssus sylviarum on leghorn roosters which, in turn, were inoculated intranasally with NCD virus, and killed 4 to 7 days later. After 36 to 48 hours, mites were collected for transfer to susceptible birds and to make emulsions that were inoculated into embryonated eggs. In 3 of the 5 trials virus was detected in the mites by egg inoculation, but none was
found in the broth used to wash the mites. None of the birds on which infested mites had been placed contracted NCD during periods of 12 to 21 days. The author concluded that mites harbor the virus only during the period of viremia in the host and therefore are not an important factor in the spread of the disease.

Contamination of Vaccine by Other Viruses

The U. S. Regional Poultry Laboratory at East Lansing, Michigan, having established that certain normal-appearing hens deposit lymphomatosis virus in eggs, suggested the possibility that vaccines made from such eggs might be a means of disseminating the disease. The possibility, as cited by Cunningham (14), is being tested by producing NCD vaccine in eggs laid by predetermined carriers of lymphomatosis as well as from eggs from birds relatively free of the disease. The vaccines are to be composed of different components of the egg and vaccinated birds will be observed over 300 days. As yet, no results are available. It might be pointed out now, however, that there was no noticeable increase in the incidence of lymphomatosis after 1938 when the first pox and laryngotracheitis vaccines made from eggs were used.

Of more importance is the fact that other viruses occasionally contaminate vaccines, as shown by Zargar and Pomeroy (37). NCD began to appear in flocks soon after vaccination with a commercial pox or laryngotracheitis vaccine, which suggested a contamination, since other sources of infection had been ruled out. A sample of the suspected vaccine obtained direct from the manufacturer was treated with penicillin and streptomycin for 90 minutes and inoculated into 3 eggs (10 days) allantoically in a dose of 0.2cc. The embryos died on the 4th and 5th days and showed pox lesions on the chorio-allantoic membrane. When inoculated into 5 chicks in a dose of 0.2cc. each, the egg fluids, which had a red cell agglutination titer of 1-512, produced no symptoms during 10 days' observation. However, the inhibition titer of a pooled serum sample of the 5 birds was 2,048 whereas that of 5 noninoculated controls was still negative. Then, on the 11th day the controls and vaccinated birds were each challenged with a subcutaneous injection of 0.1cc. of California 11914 virus, which killed all the controls in 5 days but had no effect on the vaccinated birds. Similarly, laryngotracheitis vaccine injected into the allantoic sac of 3 embryos resulted in death in 72-96 hours. Again the chorio-allantoic membrane showed laryngotracheitis lesions, the fluid had a red cell titer of 1,024 and a dose of 0.2cc. of a 10⁻¹ dilution in each of 5 chicks protected them against a challenge as in the previous test. The controls used in the previous test served as controls in this test.

Means of Spread

Brandy (28) reported that birds immune to NCD are able to eliminate the virus after inoculation, but this is not verified by the work of Prier et al. (26), at least so far as elimination in the egg is concerned. Brandy also refers to a personal communication from Pomeroy, who claims to have demonstrated virus in a chicken which was showing illness 17 months after having undergone recognizable NCD infection and on this basis Brandy believes that an indefinite carrier state is possible. He cites the estimate of Burnet that 1 in 10,000 influenza cases becomes a carrier and assumes that the same may be true for NCD.
In this connection, it should be pointed out that an attack of NCD does not always produce permanent immunity and that Pomeroy's case probably represented a second attack rather than a carrier state. Moreover, the bird in question was showing illness.

From a practical standpoint, a theoretical carrier among 10,000 recovered birds is of no importance in view of the many more-every-day sources of infection.

Brandly has also suggested that virus might be put in eggs under the stimulation of resumption of laying, but this has been amply disproved by recent work. Even if virus were deposited in the eggs, all information at present shows that the embryos of such eggs die and therefore infected eggs are of consequence only if they are broken during incubation and then only if the breaking occurs late enough to permit the virus to survive until chicks from noninfected eggs hatch.

The contamination of other vaccines with NCD virus, as already proved by Zargar and Pomeroy (37), must certainly be looked upon as a dangerous means of spreading the infection to large numbers of widely scattered flocks. With this case in mind, Brandly said, "The use for vaccine manufacture of eggs from flocks previously infected with Newcastle or other diseases is obviously not warranted."

Granted that only eggs from healthy flocks should be used for vaccine production, it seems safer to this reviewer to use eggs from birds immune to NCD to avoid the occurrence of this virus in eggs. This is supported by the work of Prier et al. (26), who showed that challenged immune birds did not deposit virus in eggs. In any event, the one demonstrated case of contaminated vaccine emphasizes the importance of more rigid licensing of commercial laboratories and better supervision of those already licensed.

As possible sources of infection, Brandly very rightly has pointed to subclinical cases in birds now considered as refractory. The isolation of virus from a gannet by Wilson (18) is an instance of infection in a heretofore unsuspected host.

Recovery of the virus from a starling by Gillespie et al. (25) suggests that a wide variety of free-flying birds might be susceptible and therefore potent sources of infection.

The shipment of birds from one country to another, especially by airplane, is an ideal means of spreading NCD. This is illustrated by the introduction of NCD into Holland by the shipment of 50 pheasants from Calcutta. Again, the introduction into California of the Asiatic type of NCD was effected through a shipment of partridge, pheasant, quail and ducks from Hong Kong (33). Apparently exposed birds went to 5 other California game farms and to farms in 4 other states, which received possibly exposed birds from the original importer's premises in Costa Costa County. The deadliness of the disease is indicated by the survival of only 1 of 40 bantams on this farm.

The introduction of the disease into Venezuela is presumed by Divo (38) to have been through the importation of baby chicks from a Louisiana hatchery.

Recently the Federal Register published proposed regulations to extend the Bureau's quarantine authority to cover importations of poultry so that all importations, excepting from Canada and Mexico, be required to go through inspection and quarantine before entering the country.
REGULATIONS

Brueckner (36) sent questionnaires to all chief livestock sanitary officers and received replies from 47. The study of these showed that 32 states had laws or regulations covering interstate importations. In 20 states the laws or regulations were of a general nature, in only 9 were specific diseases named and in 7 others, diseases in general were covered with specific mention of such infections as pullorum, tuberculosis, fowl cholera and NCD. In only one state were the regulations administered entirely by laymen; in 5 others, administration was by laymen and veterinarians jointly.

Intrastate regulations for the control of diseases existed in 38 states. These were usually of a general nature, but occasionally specified such infections as pullorum, tuberculosis, NCD, bronchitis and laryngotracheitis. In 20 of the states, administration was by veterinarians, in 6 by laymen and in 12 by veterinarians and laymen jointly.

In 34 states, regulations were in effect covering vaccines. In 27 states these were administered by veterinarians; in 4 jointly, and in 3 solely by laymen.

In 9 states, live virus vaccines were administered only by veterinarians, in 7 there was veterinary supervision or by special permit. The regulations were said to be rigidly enforced in 8 states, in 5 of which they were administered by veterinarians.

The answers to the question as to the percentage of vaccination done by veterinarians varied from “none” to 100.

VIRUS ISOLATION

Beaudette et al. (6) conceived the idea that failure to isolate the virus by routine procedure from tissues of some birds whose mates had yielded the virus might mean that, in the former, immune bodies had developed in sufficient concentration to mask the presence of the virus. In this event it was thought that perhaps by inoculating more dilute suspensions, a point beyond the limit of activity of the immune bodies, but still within the range of activity of the virus, might be reached so that the virus, so freed, would kill the embryos of inoculated eggs. However, when tissues negative by the usual procedure were diluted from 1-50 to 1-1500 and inoculated in a dose of 0.2cc. into the allantoic sac (thus effecting a further dilution of 30 times by virtue of the 6cc. content), the results were still negative.

Cunningham (14) records the results on 1,012 specimens examined for NCD. Of 408 tissues inoculated for virus isolation 116 were positive. The remaining 604 samples were submitted to HI tests and 143 were positive.

SEROLOGICAL TESTS

Jungherr et al. (3) reported that of 22 sera from mumps patients 13 gave neutralization indices of over 250. Of these, 10 had indices of 1,000 and above, whereas only 3 of 23 control sera (17 from mild meningoencephalitis and 6 clinically diagnosed as nonparalytic poliomyelitis) showed neutralization indices over 250 and none went over 800. Serological relationships were also demonstrated by hemagglutination-inhibition tests on 20 pairs of heat-inactivated mumps sera. Of these, 7
showed a 4-to-64-fold rise of titer between acute and convalescent phases. Four others showed titers of 1-64 to 1-256 in convalescent sera. These titers were above those found in 20 pairs of sera from the control group, of which none showed a rise of inhibiting capacity. On the basis of these results, the authors suggested that a diagnosis of NCD infection in humans be made with caution, especially in the absence of virus isolation.

Zargar and Pomeroy (9) devised a rapid whole blood hemagglutination-inhibition test for the diagnosis of a past infection of NCD. The antigen consists of a mixture of 25cc. of amnio-allantoic fluid (titer of 1,000 or more), 1cc. of sodium citrate (25 per cent) and 74cc. of physiological saline. In the test, 0.1cc. of antigen is placed on a ruled glass or opaque glass plate and with this is mixed a loopful (0.02cc.) of whole blood from a punctured wing vein. The plate is rotated and a reading made in 2 to 5 minutes. The blood of negative birds does not prevent characteristic hemagglutination, whereas the blood of a positive bird prevents agglutination. The test was tried on over 200 birds with good results, but it is admitted that birds having a low inhibition titer are a problem.

Bağkaya (16) used a rapid serum and whole blood test in studying the disease in Turkey and found that these gave results similar to those of the usual HI test. The disease in pigeons was also identified by HI tests, but pigeon cells were agglutinated by fowl serum and therefore could not be used for tests with chicken serum.

Levine and Fabricant (32) found a close relationship between the HI and SN titers of hens vaccinated or naturally recovered and these values in their progeny. In an earlier paper, Howitt et al. reported neutralization of NCD virus in a high percentage of human sera, but because of this finding in the absence of virus isolation and because of many positive sera in animals not exposed to NCD the problem was reinvestigated with sera inactivated at 56°C. for 30 minutes. In duplicate tests with heated and nonheated sera those positive in the nonheated state were negative with heated serum. Tests on sera of 30 persons who had recovered from a mild illness gave a positive reaction in 11 (36 per cent) cases on the basis of neutralizing 1,000 or more embryo doses, but the same sera as well as others of lower titers gave negative results after heating. Of 33 nonheated sera from normal persons 11 (33 per cent) gave a positive result, but all were negative after heating.

In a lot of 71 normal (nonheated) sera from persons in Tennessee, 4 neutralized 1,000 or more embryo doses, 15 neutralized between 100 and 1,000, 11 under 100 and 41 were negative. Lack of neutralization in these cases is attributed to failure to freeze samples promptly, which permitted destruction of the heat-labile factor. It was also demonstrated that with sera of laboratory animals not in contact with NCD and tested at various periods of holding with and without heating, 2 monkey sera (one a pool), guinea pig and hamster pools neutralized significant doses before heating, but only a single dose after heating. Sera of hamsters, ferrets, mice and chickens were negative before and after heating. When monkeys were immunized against NCD and the sera tested a short time after collection, the neutralization index was very high, but if heated, the titer dropped 10- to 100-fold. Mere holding from 6-7 months also reduced the titer as well as the complement content.

When simultaneous neutralization tests and complement determinations were made there appeared to be a relationship to the end that when no complement was
present there was no neutralization, but complement could be present without evi-
dence of neutralization.

The rise in the neutralization index of sera of persons after a mild illness, as re-
ported in the previous paper, was explained by the method of holding the sera that
showed a low titer prior to the illness. These original samples (prior to April 1948)
were held at 4–6°C. and subsequent bleedings at –10°C. Samples that remained
unfrozen for over a year were negative and also devoid of complement. Thus, de-
terioration was also a product of time.

It was determined that when neutralizing serum was “decomplemented” by ab-
sorption with egg albumen precipitate it also lost its neutralizing ability; however,
addition of fresh guinea pig serum or normal human serum did not restore the neu-
tralizing property. On the other hand, immune chicken serum did not show much
difference whether unheated or decomplemented, but the index was increased after
addition of fresh normal chicken serum even though this contained a small amount
of complement. Thus, it was concluded that the nonspecific neutralization is due to
a heat-labile factor present in serum in varying amounts according to methods of
preservation. This factor is presumed to be associated quantitatively with one of
the 4 components of complement.

Schmittle (34) reported on a comparative study of HI results obtained with blood
serum and with egg yolk prepared by an improved method. One and one-half cc. of
yolk were placed in 6cc. of .85 per cent salt solution and shaken, after which 2cc. of
ethylene dichloride and 1cc. of diethyl ether were added and thoroughly mixed.
This was followed by incubation at 50°C. for 4 hours and 4°C. for at least 8 hours.
This latter treatment brought down a “cold precipitate” which, if left in solution,
caused a slight nonspecific virus inhibition. It was also found that if albumen con-
taminated the yolk the supernatant fluid became cloudy, and this also inhibited
agglutination. In fact, of 56 samples not contaminated with albumen, all were sat-
isfactory for testing; 42 samples contaminated with albumen gave unsatisfactory
results. The technique employed for the comparative study was the Beto HI de-
scribed by Brandly et al. The California virus (11914) was diluted so that 0.25cc.
contained 10 agglutinating units. The red cells were made up to a 1 per cent sus-
pension and were not used more than 4 days after collection. In setting up the tests,
serum and yolk extracts were diluted with saline two-fold from 1-5 to 1-1280 in
chemically clean 13 x 130mm. tubes. Then 0.25cc. doses of each dilution of serum or
yolk extract were transferred to 10 x 75mm. tubes. To each tube were added 0.25cc.
of virus dilution (10 units) and 0.25cc. of cell suspension. Three additional tubes
supplied serum, virus and saline controls. Incubation was a room temperature for
15 minutes and readings were made every 5 minutes until the red cells in the serum
control tube settled. The highest dilution of serum or yolk extract in which there
was complete inhibition was considered as the HI titer and complete inhibition by
serum or yolk extract diluted 1–5 or more was considered as positive.

The experimental birds used in the comparative study included 49 W. Rocks not
previously exposed, 65 Leghorns purchased from a recovered flock and 68 hens that
had been artificially exposed. Serum and eggs were collected the same day.

The results showed the 49 negative birds to be negative to both tests. Likewise,
the serum and yolk extracts gave positive results with the 65 naturally recovered
birds, with equal titers in 36 (55.4 per cent), a serum titer twice that of the yolk titer in 28 (43.1 per cent) and 32 times greater than the yolk extract titer in 1 (1.5 per cent). With reference to the 68 birds recovered from artificial exposure, both tests were positive in 63 (92.6 per cent). The serum titer was one-half the yolk titer in 6, equal to the yolk titer in 38, twice to 16 times greater in the remaining 19. In the 5 samples not covered by the above, 3 were positive to the serum test and negative to the yolk extract test, and 2 were negative to both tests.

Durusan, as reported by Cunningham (14), exposed allantoic fluid to temperatures of 4°, 22-27°, 37.5°, 56°, 62°, 77° and 100°C. and at intervals titered samples for infectivity and hemagglutinating ability (HA). The results showed that the HA activity was more thermostable than the infective ability.

Brandly (28) also demonstrated that exposure to 56°C. affected the HA ability in different strains over a range of 5 minutes to 6 hours.

**EFFECT OF DISEASE ON EGG QUALITY**

In a study on the effect of NCD on egg quality, Parnell (19) used 5 houses of Leghorns in their first year of production and of similar breeding and all on the same feed. They differed in that 2 houses had not had the disease, one was in the acute stages, one had recently recovered and one had recovered 3 months previously. Beginning March 16, eggs were collected from each house until a total of 105 had been gathered from each. Five eggs were immediately broken and the albumen index score was recorded. The rest were stored at 36°F. for gradings at 2, 4, 8, 16, 32 and 64 weeks. The Van Wagener method of scoring was used (1-5) in which 1 represented a perfect score. The results showed a marked difference in the albumen index of fresh eggs from the two groups—affected and nonaffected—but as the storage period advanced the difference was less pronounced. Thus, for eggs from NCD houses the index varied from 2.4 to 4.3 and for noninfected pens from 1.8 to 3.8. The yolks were uniformly good in both lots.

Fresh eggs were graded on the basis of U.S.D.A. standards and those from nonaffected houses were normal for the area. Those from a house recovered 3 months previously ranked next and in decreasing order those from recently recovered birds and finally those from birds during an acute attack.

Grading after storage for 4, 16 and 64 weeks showed that loss from inedibility appeared earlier and was greater in eggs from affected pens at all periods. The cause of inedibility was frequently a stuck yolk, a condition frequently associated with watery albumen.

**DIFFERENTIAL DIAGNOSIS**

Jansen and Kunst (2) studied a duck plague first seen in 1923 by Baudet and later by DeZeeuw (1930) and Bos (1942) in comparison with fowl plague and NCD. This duck disease, with an incubation period of 4 to 10 days is pathogenic only for ducks and even geese resist intravenous injections. The strain used in the study was that isolated by Bos. The virus occurs in the blood and organs. Since ducks are also susceptible to NCD (death in 7 days with paralysis) and insensitive to fowl plague, except by intracerebral injection, a closer relationship with NCD was suggested. However,
1. Ducks immune to duck plague are still susceptible to NCD.
2. Ducks that have resisted an injection of fowl plague virus (and whose blood contains HI antibodies to a titer of 1-1250) are still as susceptible to duck plague as the controls.
3. Mice which resisted an intracerebral injection of duck plague virus are still susceptible to a subcutaneous injection of fowl plague and to an intracerebral injection of NCD virus.
4. Chickens that have been injected with duck plague virus are still susceptible to fowl plague and NCD viruses.
5. Duck plague immune serum does not prevent red cell agglutination by NCD and fowl plague viruses and does not inhibit growth of these viruses in embryonated eggs. Reciprocally, immune fowl plague and NCD sera do not inhibit growth of duck plague virus in eggs.

Thus, it was concluded that there is no relation between duck plague, fowl plague and NCD. Furthermore, it was impossible to infect chicken eggs with blood virus by any mode of inoculation, but this could be adapted to duck eggs (12 days) by chorio-allantoic inoculation. The embryos were still alive after 4 days when harvested, but a second passage in duck eggs killed all the embryos and the harvested membrane was pathogenic for ducks. After 12 duck egg passages the virus passed to chicken eggs (9 days) developed the ability to kill embryos in 4 to 5 days by the third passage. This virus, however, had a lower pathogenicity for ducks and though still pathogenic after 10 passages in eggs, it was nonpathogenic by intramuscular injection after 20 passages and the inoculated ducks were immune to duck plague virus. Immune duck plague serum inhibited the growth of the adapted virus in chicken eggs and a neutral serum-virus mixture did not immunize ducks.

The virus adapted to chicken eggs was less pathogenic for the egg than was either fowl plague or NCD virus since it kills in 4 to 5 days, whereas plague kills in 1 day and NCD in 2 days. After adaptation, the virus can be grown in the allantoic sac, but kills only after 6-7 days, and still fails to be pathogenic for chickens.

Finally, duck plague virus does not agglutinate chicken, duck, horse or sheep cells and exhibits no interference to the growth of plague or NCD virus in eggs when injected 2 days prior to either of these.

In the differentiation of bronchitis and NCD, Fabricant (5) resorted to the inoculation of 12 eggs (9 days) with a suspension of tracheal exudate suspended in saline and incubated one hour after treatment with penicillin and streptomycin. Dead embryos were harvested as well as those showing dwarfing but still alive 6 days post-injection. Allantoic fluid was harvested for further inoculation. Allantoic fluid of dead embryos was subjected to HA and HI tests and, if negative and no dwarfing was observed, the material as well as fluid from live embryos harvested at 6 days was carried through at least 2 additional passages. If the results were still negative, the sample was judged to be free of bronchitis. The use of fluid of embryos dead in the first or second passage in an HA test was calculated to facilitate the identification of NCD. In the test the usual 0.25cc. each of fluid (dil. 1-20 and 1-100) saline and red cells (0.5 per cent) was used with suitable positive and negative controls.

The author points out that allantoic fluid of dead embryos of the first passage
may be HA negative because of insufficient virus, but that in the second passage if NCD virus is present all embryos die and the fluid is HA positive.

In the course of the 116 isolations of bronchitis, Fabricant was able to confirm Delaplane's observation that allantoic sac inoculation resulted in an earlier adaptation of the virus as evidenced by dwarfing. This was also associated with a decrease in the size of the amnion and loss of amniotic fluid.

As another characteristic of virus growth, Fabricant referred to a curling of the embryo ventrally on its long axis, even in the absence of dwarfing, which it precedes. This change, also produced by the Beaudette strain, was considered as diagnostic if it occurred in the first 3 passages. Of 116 isolations, 96 showed the change. A virus was considered typical if, on first transfer, 2 of 12 embryos showed the change or if at least one-third had characteristic lesions or significant embryo deaths on second or third passage. Death of embryos was considered typical if it occurred at least 40 hours after inoculation and if allantoic fluid was free of contamination and NCD virus. One strain isolated killed 100 per cent of the embryos in 48 hours by the sixth passage when a dose of 0.1 cc. of a $10^{-4}$ dilution was used.

Of the 96 typical strains isolated, 53, 31 and 12 showed typical embryo lesions by the first, second and third passages, respectively. Of the 20 slowly adapted strains 1, 7, 11 and 1 showed typical lesions on the first, second, third and fourth passages, respectively. Apparently no relation existed between the rapidity of adaption to eggs and the clinical history of the case from which the isolation was made and no relation existed between the behavior of the virus in eggs and the duration of the disease in the flock. The virus could be recovered as long as symptoms existed. Of 26 cases with typical respiratory symptoms and a moderate drop in production, virus was isolated from 24 (92 per cent). And of 36 cases presented at the onset of respiratory symptoms and before a drop in production, virus was recovered from 34 (94 per cent).

Kunst (13) reported on the differentiation of NCD and fowl plague by use of immune rabbit sera which had been inactivated at 56°C for 30 minutes. In inhibition tests neither immune serum prevented agglutination by the heterologous virus. Neutralization and cross neutralization tests were made in embryonated eggs and the allantoic fluid was tested 2 days postinoculation for HA bodies. Virus was found to multiply only in the presence of heterologous antiserum.

In comparative studies, the identity of the California strain with the Weybridge NCD strain was established as well as that of the Weybridge fowl plague strain with the "klassische Geßfüglvelopst" strain. The Brescia strain, however, was not neutralized by plague-immune serum and Brescia immune serum inhibited agglutination only by Brescia virus and not by Weybridge fowl plague or NCD strains. In neutralization tests in eggs the Brescia strain differentiated itself from the Weybridge plague strain, but was considered as a plurality of plague.

The author observed that after elution NCD virus is capable of agglutinating fresh cells, but that the cells which eluted virus can not again be agglutinated by NCD virus but still retain susceptibility to agglutination by plague virus. A further observation confirmed was that plague virus agglutinates chicken, duck, horse and sheep cells whereas NCD virus clumps only the avian cells. By this difference, virus cultivated in eggs could be identified, that is, agglutination of mammalian cells was
RECENT LITERATURE ON NEWCASTLE DISEASE

proved to be a property of plague virus. When both viruses are inoculated into an egg the allantoic fluid agglutinates sheep cells by virtue of the plague virus and even after long contact with sheep cells it is still able to agglutinate chicken cells by virtue of NCD virus. The Brescia strain differentiated itself from plague by its ability to agglutinate sheep cells but not those of the horse.

Intracerebral inoculation of mice with NCD virus in the form of allantoic fluid usually produced death after a few days to 2 weeks and usually the animals showed paralysis of the hind quarters. In these, virus was found in the brain only. Serial passage was impossible except in one case in which the second passage mice died. Mice were not susceptible to an intraperitoneal injection, but subcutaneous infections immunized against an intracerebral injection 18 days later. In contrast, mice are susceptible to intracerebral plague injections. After a few passages the virus is infectious by the subcutaneous route and virus occurs in the blood and other organs as well as in the brain. Mice which survived an intracerebral injection or which had received a subcutaneous injection of NCD virus were not immune to a subcutaneous injection of plague virus. A subcutaneous injection of plague virus (allantoic fluid) protected mice against a mouse-adapted plague strain, but such mice were not immune to an intracerebral injection of NCD virus.

In a clinical differentiation between bronchitis and NCD, Fabricant (20) has pointed out that in birds up to 10 weeks of age both diseases cause respiratory symptoms and mortality, but the mortality is less in bronchitis. In every case exhibiting the combination of respiratory and nervous symptoms, NCD has been confirmed by HI test. In birds 10 weeks to 4 months of age respiratory symptoms are mild, but more marked in bronchitis and some birds develop a nasal discharge. The symptoms are virtually the same in layers in either disease, that is, respiratory symptoms, decreased food consumption and production, but decrease in production is more rapid and often reaches zero in NCD whereas in bronchitis it is more moderate and rarely reaches zero. In outbreaks of both diseases floor eggs are common and there are abnormally shaped eggs, defects in shell texture and poor interior quality. Bronchitis is said to spread more rapidly than NCD.

Associating the clinical histories with egg inoculation results, Fabricant found that typical histories of either disease usually resulted in recovery of the virus in question, but atypical cases yielded either virus. In 190 attempts at virus isolation from birds with respiratory symptoms, 116 yielded bronchitis, 51 NCD and 23 were negative. In 36 cases in layers with typical bronchitis with moderate or severe drop in egg production and a negative HI test, bronchitis virus was recovered 34 times. In 49 cases of respiratory infection in layers at onset, 34 gave bronchitis, 11 NCD and 4 were negative. In 51 cases of respiratory infection in chicks and broilers, 22 yielded bronchitis, 24 NCD and 5 were negative. Of 13 cases of mild respiratory infection of slow spread and long duration, 9 were positive for bronchitis and 4 were negative. Five cases of NCD were diagnosed by virus isolation where the HI test was negative, but these were only of 1 to 4 days' duration. Seven cases of NCD diagnosed on the same basis gave both negative and positive HI results in different birds. Using the HI test as a guide in the diagnosis, Fabricant concluded that a clinically typical NCD with a positive HI, both positive and negative results in different birds (if not vaccinated), or a negative or low titer followed by a positive
titer 3 or 4 days later should be diagnosed as NCD; and that a clinically typical bronchitis history coupled with a negative HI test, or if the history is not indicative and the results of HI tests made at intervals of a few days are both negative, a diagnosis of bronchitis should be made. The author warns against a positive HI test in chicks under 4 weeks of age, as this might be due to parental immunity.

According to Levine and Fabricant (23), a disease appeared in ducks in the eastern end of Long Island in March 1948, and the first virus isolated was that of NCD. This virus was recovered a second time on the same farm. In all other cases a virus that was differentiated from NCD was isolated. At first the disease affected ducks 2–3 weeks old; later, it affected younger ducks until finally ducks 3 days old were affected. Within 3 months half the farms experienced losses, and by October virtually all the farms in the area were affected. The mortality varied from farm to farm and from hatch to hatch and amounted to 85–90 per cent. The duration of illness was usually not more than an hour. Affected ducks were somnolent, held their eyes half-closed, fell on their backs and died with head drawn over the back. The losses, covering 3 to 4 days, were highest on the second day. Breeding ducks were not affected nor were production and hatchability, and the disease did not spread to broilers (chickens) or to turkeys on the same farm.

On autopsy, infection of the air sacs and pericarditis were found. In young birds there were swelling of the liver, occasionally hemorrhages, swelling of the kidneys and injection of the blood vessels.

A virus was isolated from 30 shipments of duck material originating on 13 farms. On inoculation into eggs, the embryos dead up to 4 days showed no specific changes, but in later deaths the embryos were edematous, small, showed an enlargement of the amnionic sac with a more fluid content and a smaller yolk sac the contents of which were more viscous. The livers were greenish and many showed yellow necrotic areas. The greenish color was also evident in the egg fluids and even in the yolk sac or embryo. Allantoic fluid killed 10 to 60 per cent of the embryos by the sixth day and those in which incubation was continued failed to hatch. Both Seitz and Berkefeld W filtrates were found to be active.

Serum immune to the duck virus neutralized the homologous virus, but failed to neutralize NCD virus and immune NCD serum failed to neutralize the duck virus.

In one animal inoculation test involving 5-day-old ducks and 2-week-old chicks, egg fluids failed to produce infection by intravenous, intramuscular and oral administration. In another test, when suspensions of internal organs, blood and brain were used, only 2 of 5 ducks (day old) died in 48 hours even though virus was demonstrated in the inocula by egg inoculation. Curiously enough, when the NCD and duck viruses isolated from the one flock were injected separately and combined into week-old ducks, results were negative. In a fourth test there were 2 houses, each with 2 pens, each of which had two types of inoculated ducks plus contact controls. The result was that 0.25cc. of embryo liver suspension or egg fluid intramuscularly, or 0.5cc. of the same inocula orally, produced the disease in day-old ducks and the contacts contracted the disease later. A similar experiment gave essentially the same result and also showed that immune duck serum gave good protection.

In view of the occurrence of a similar disease of ducks in Holland, the authors point out that the American virus grows in eggs on primary inoculation, whereas
the Holland virus does not grow on primary inoculation in chicken eggs. Also, the American virus does not produce hemorrhages in the embryo and not all embryos die, whereas the Holland virus kills embryos after 4 days and produces hemorrhages. The duck virus differs from NCD in that the former fails to kill all embryos in 48 hours, does not clump red cells and is not neutralized by NCD immune serum. The curled embryo and loss of amnionic fluid in eggs inoculated with bronchitis, in turn, differentiate it from the duck virus.

In Venezuela, Divo (38), identified NCD by demonstrating that the virus was filterable through Berkefeld W filters (but not Seitz EK), that it grew in embryonated eggs, agglutinated red cells, and reproduced the typical disease in chicks and pigeons. Immune NCD serum neutralized two American strains (California and Isele).

**IMMUNIZATION**

In 1949 (1), results were reported on the use of commercial live virus vaccine in California on birds hatched in 1948 on farms where the disease existed in 1947. Vaccination was done variously at 4 weeks to the nonlaying age and from 20 to 50 per cent of each flock was left as controls, which served to show the rate of spread and severity of the disease so acquired. Before vaccination, HI tests were made to establish susceptibility and after vaccination, to determine the time at which immunity is developed and its duration as well as spread to nonvaccinates. Twelve flocks were tested for 200 days and 2 for the whole laying year. The vaccine was applied by the stick method; 1cc. of virus was sufficient for 100 to 150 birds. In one preliminary test involving chicks 31 days old, 5 cages were set up each containing 2 chicks, each of which received 0.1cc. of virus intramuscularly, and a contact. Of the vaccinates, 1 died with nervous symptoms and yielded virus. One contact died with typical symptoms and all others lived and gave a positive HI test at 14 days. In a second trial of 2 cages, each with 15 "wing" vaccinated birds, and 5 controls, all birds showed respiratory symptoms on the 12th day and for 8 more days, but there was doubt as to the nature of the illness.

In the field tests, 21 flocks containing 55,540 chickens and 1 flock of 4,200 turkeys were vaccinated. Of the 21 chicken flocks, 17 (45,452 birds) were 5 to 18 weeks old and 4 flocks (2,758 birds) were 20–24 weeks old and starting to lay. The turkeys were 4½ and 6 months old.

In birds 5–21 weeks of age respiratory or nervous symptoms, or both, appeared in 16 of 17 flocks in 6 to 14 days, except in 2 cases in which they were delayed to the 21st and 27th days, respectively, and lasted from 4 to 36 days. The mortality from NCD alone ranged from 0 to 2.6 per cent, with an average of 0.8 per cent. Spread to nonvaccinates occurred in all but one (in which controls were separated). The disease acquired by contact appeared milder than in vaccinates. The earliest symptoms in controls appeared at 21 days and in one case not until 42 days. The appetite was impaired for a short time beginning at about a week, but no noticeable disturbance to growth was noted.

NCD virus was recovered from 4 birds (3 with respiratory, 1 with respiratory and nervous symptoms), 2 from each of 2 flocks removed 13 and 24 days postvaccination, but this was considered to have been a recently acquired infection. Concurrent
Coccidiosis and laryngotracheitis in 2 flocks did not appear to increase the severity of the reaction and multiple vaccination in 2 flocks with NCD and pox appeared to be a satisfactory procedure; however, the antigenecity of the NCD appeared to be suppressed.

Immunity, on the basis of HI tests, had not declined in 200 days.

Of 4 flocks just beginning to lay when vaccinated, one reacted mildly with lowered production for 3 weeks and 3 developed nervous symptoms and suffered a loss of 2.5, 8 and 2.6 per cent mortality, respectively. In turkeys the reaction was more severe than in nonlaying chickens and the loss was 2.5 per cent. "Takes" were easily recognized on the 3rd to the 5th day, but were not observed in chickens with any regularity.

In a critical paper dealing with factors to be considered with reference to the use of live virus vaccines, Moses (4) pointed out that in laying birds such vaccines affect production adversely and in "newly hatched stock" produce "considerable losses." Since these attributes are admitted by manufacturers and serve as a guide in setting age limits for vaccination, it seems rather pointless to raise such questions. Moreover, "newly hatched stock"—presumably meaning chicks from susceptible parents, are rare in epizootic areas. Similarly, the danger of spread from vaccinated chicks to laying birds is exaggerated, because in areas where vaccination of chicks is required, the necessity exists by virtue of widespread infection previously and therefore, the adult populations are largely immune and their parentally immune chicks are protected to an age suitable for vaccination. In any event, should the vaccine strain spread, it still retains its mild character. There is no evidence of revertibility to greater virulence where transfer has occurred accidentally or was intentionally permitted.

Moses very rightly warns against attempts to produce a vaccine strain of very low virulence because in doing so a point of overmodification may be reached at which the immunogenic power of the strain is correspondingly lessened.

Similarly, the suggestion that vaccination should complement sanitation is basically sound.

A further report on the results of intranasal vaccination is given by Hitchner (22) in which vaccine made from 10- instead of 11-day-old embryos was used in production and which was suspended in buffered saline (pH 6.5) in place of broth to make a 20 per cent suspension of the entire embryos. To show that chicks from intranasally vaccinated parents (37 and 195 days previously) were susceptible, 71 were challenged with the virulent California strain at 1-3 days of age with the result that 57 (80.2 per cent) developed paralysis (37) or respiratory symptoms in the next two weeks. Here it might be pointed out that allowing a 2-week period might permit several chicks having a short-timed immunity to return to a susceptible status. In fact, the pre-injection HI titers (higher in chicks from more recently vaccinated parents) which ranged, with one exception, from 40-320, would suggest this. Similarly, the development of paralysis in only 2 chicks (0.97 per cent) of 206 similar chicks vaccinated during the first week and challenged at 34 to 133 days is not proof that immunization occurred while parental immunity was carried. The 2 chicks in question had been hatched from hens vaccinated 46 and 59 days previously and the author suggests that some parental immunity might have interfered with the de-
development of an active immunity. In this lot of chicks prechallenge HI titers were significant to 41 days of age, but at 72 and 133 days the titers were 5 to 10. The 204 control chicks in the experiment challenged at 27 to 133 days of age showed 154 (75.4 per cent) paralysis or respiratory symptoms.

With regard to day-old chicks from hens vaccinated by the "stick" method 126 days previously with live virus, a pool of 11 samples showed an HI titer of 160, but of 25 challenged at 1 day 19 (76 per cent) showed "evidence of infection" within 11 days and of 54 from the same group vaccinated at one day and challenged at 5 weeks of age, 1 (1.8 per cent) showed evidence of infection, whereas 55 controls challenged at the same time resulted in 39 (70.9 per cent) "visibly infected".

In field vaccinations by poultrymen on chicks ranging from 1 day to maturity, loss among 182,939 in 91 flocks for 3 weeks' postvaccination was 3,744 or 2 per cent. The loss among 136,552 under one week of age was 2.1 per cent, and of those 1–2 weeks old 13.5 per cent, largely due to the loss of 451 in one flock of 3,100.

In addition to the above, 16,874 turkeys of various ages and 15,750 laying birds were vaccinated. Results with turkeys were similar to those with chickens. In laying birds, with few exceptions, there was no drop in production and the exceptions were attributed to the presence of a virulent infection at the time. As to the duration of immunity, it is cited that of chicks vaccinated at a day of age and challenged a year later, one out of 15 died and the others showed no clinical evidence of NCD, and no marked decline in production but some effect on the egg shells was noted.

**DURATION OF IMMUNITY**

Discussing the question, Brandly (28) pointed out that claims or implications by manufacturers that living vaccine produces a life-long immunity were not founded on experimental evidence. He has overlooked the fact that the concentration of immune bodies in the blood of vaccinated birds approximates that in naturally recovered birds and since the latter were considered—at least until recently—to have a life-long immunity, then it was not amiss to assume that vaccinated birds also would enjoy a similar immunity.

The duration of parental immunity in chicks was investigated by Levine and Fabricant (32) because of the occurrence of NCD in 2-week-old chicks from vaccinated hens. Allowing 4 days for incubation, these workers deduced that infection must have taken place at about 10 days of age. Two experimental flocks were used, one (A) vaccinated at 5 months of age, 10 months previously and the other (B) recovered from a natural outbreak 9 months previously. The HI and SN titers were determined on each hen used. All chicks were hatched and brooded at the same time—usually 3 to 5 chicks from each hen. Two to 5 days after hatching, all chicks from a given hen were brought to the laboratory and 1 or 2 were bled for HI and SN tests and then challenged intranasally by a drop of virus (outbreak B strain) in each nares. The chicks were again bled for HI tests 10 days to 2 weeks later.

The tests showed, first, that 5–10 per cent of the hens from flock A (vaccinated) were HI and SN negative. In fact, of 29 used, 5 were negative. The 5 chicks from these, tested at 1 and 7 days, were also negative and of 13 challenged, all developed rales and 2 died. The survivors developed appreciable HI titers (320–25,600) by 10 to 14 days postchallenge. Of 5 chicks from hens (with one exception) that showed
appreciable SN and HI titers and tested at 10 days, 2 were negative and 3 positive
to the HI test and all were negative to the SN test (11 chicks). On challenge, the 11
developed râles and an increased titer.

Tested at 14 days 23 chicks were negative to HI and the 5 tested for SN were also
negative, but the hens that produced them had appreciable HI and SN titers (with
one exception). On challenge of 9, all developed râles and significant titers.

Of 20 chicks tested at 17 days, 15 were negative to the HI test and 19 to the SN
test in spite of the fact that the parents carried significant titers to both tests. When
33 were challenged, all developed râles and subsequent significant HI titers.

In another experiment, 10 dams showed significant HI (2,560 to 25,600) and SN
(10⁴ to 10⁶) titers. Their chicks tested at 1, 5 and 7 days of age also showed signifi-
cant HI (one exception) and SN titers, but all developed râles and 2 of the 5-day-
old chicks died. The postchallenge HI titers, however, were not higher than the
prechallenge titers except in the 7-day-old chicks.

In experiments with naturally recovered hens (B) and their progeny, all hens
carried significant HI and SN titers. The chicks tested at 1, 4, 7, 11, 14 and 18 days
showed an increasing number of negatives to the HI test with age, those at 18 days
being negative and all showing râles after challenge. Here it should be noted that
in all the experiments the challenge caused râles and not death, as would be expected
if a highly virulent strain were used. Unfortunately, the virulence of the chal-
lenge strain cannot be estimated, since the susceptible controls were not included.
Moreover, as pointed out above, the postchallenge HI titer of chicks challenged at
1 and 5 days of age was not significantly higher than the prechallenge titer, sug-
gesting, at least, that if most of the virus had not been neutralized there would have
been some residual virus to stimulate the production of antibodies. Thus, while the
study showed that chicks from immune parents carry antibodies and may be im-
mune to intramuscular injection, they are susceptible to intranasal injection, at
least to the extent of exhibiting râles. Deaths, however, were not produced except
in a few chicks and, in at least some of these, no immune bodies were demonstrated
before challenge. To the extent that these may serve as controls, therefore, the
tests show that while chicks which carry demonstrated antibodies may show symp-
toms on intranasal challenge, at least they are protected from a fatal issue.

That failure to produce a lasting immunity is not confined to the mild strains
used in the United States is shown by the report of Bornstein et al. (11) concerning
flocks in Ramot Hashavim, Palestine, vaccinated with the more virulent "Muk-
teswar" (or Indian) strain. From November 1947 and for about 2½ months, 21 of
55 vaccinated farms suffered outbreaks of NCD. Generally, as these breaks oc-
curred, the pen or flock was revaccinated so that the reaction which began 4 days
later (loss in production) was attributed to vaccination, while the mortality and
culling were attributed to the disease proper. The low mortality was ascribed to a
residual immunity from the primary vaccination. There was some evidence that
earlier hatches were more susceptible than later hatches, which was interpreted as
evidence that immunity tended to diminish with time. On the other hand, since the
chicks hatched prior to April 1947 were vaccinated at 2–3 weeks and those hatched
later were vaccinated at 4–8 weeks, it was possible also that whatever parental im-
munity the younger chicks had might have interfered with the development of a
better immunity. However, by means of a beta-like method of determining the HI titer there appeared to be an inverse relation between the length of time since vaccination and the titer. On the basis of a survey made in 70 pens on 15 farms involving 8,068 laying birds in which 143 blood samples from 27 pens on 8 farms were studied, it was concluded that the duration of immunity resulting from vaccination with this strain could not be depended on for more than a year, that the results of HI titers agreed fairly closely with facts observed in the course of the outbreaks and, finally, that a titer of about 300 was required to protect completely a flock against the adverse effects of the disease proper or against the effect of revaccination.

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THE INTRANASAL VACCINE—ITS ROLE IN A NEWCASTLE DISEASE CONTROL PROGRAM*

S. B. HITCHNER, B.S., V.M.D., G. REISING, B.S., M.S. AND H. VAN ROEKEI, B.S., D.V.M., M.S., Ph.D.

Department of Veterinary Science, University of Massachusetts, Amherst, Mass.

Continued observation and experience with Newcastle disease of poultry has revealed several difficulties in its control which have emphasized the complexity of the problem. Unlike some of our other vaccine-controlled diseases, NCD (Newcastle disease) may result in serious losses in birds of any age. This requires protection from the day the chicks are hatched until they are marketed. At first it was anticipated that early protection in baby chicks for the first three or four weeks of age would be afforded by passive immunity. At the termination of this immunity it was hoped that active immunization at four weeks of age by a live virus vaccine of sufficiently low virulence would give protection for the remainder of the bird's life. This control program as originally proposed has been somewhat disappointing under actual field conditions. The passive immunity in baby chicks, although it has a mitigating influence upon the disease in chicks, has proved so variable in its protection that it may fail to prevent natural outbreaks. The potency of the wing web live virus vaccines is too great to be recommended with safety in chicks less than four weeks of age. Hence, under this program many chicks are left without protection during the most critical period of their lives from the standpoint of mortality from the disease. Further disappointment has been met in the duration of immunity resulting from the wing web method of vaccination. Undoubtedly many of the so-called "breaks" during the past year have been due to improper application of the vaccine, but there is reason to believe that this is not the sole cause for vaccination failures, as it still remains to be experimentally proved that one application of the wing web type of virus does confer permanent immunity. Also, the wing web vaccines are too potent to be used on laying flocks and this has prevented some poultrymen from getting started on a vaccination program. The killed virus vaccines have aided in filling the deficiencies of the live virus control program but they still possess limitations in degree and duration of immunity conferred.

INTRANASAL VACCINE AND FACTORS INFLUENCING ITS USE

In discussing the role of the intranasal vaccine, produced from the B1 strain of NCD virus, we do not wish to intimate that it is infallible and should replace all other types of vaccines. It, like the other vaccines, has certain definite advantages and certain definite limitations. By recognizing the attributes and limitations of the respective types of vaccines we may eventually be able to supplement the deficiencies of one vaccine with the advantages of another to greatly enhance the effectiveness of our immunization program. The low virulence of the intranasal vaccine, permitting its administration to baby chicks and laying flocks, has enabled

* Contribution No. 773 of the Massachusetts Agricultural Experiment Station.
THE INTRANASAL VACCINE

poultrymen to fill the gaps left by the other live virus vaccines. In using a virus of sufficiently low virulence that it can be given to baby chicks, it is admitted that a certain degree and duration of immunity is sacrificed. In respect to the systemic reaction and immunogenic response of low and highly virulent strains of NCD viruses a good corollary might be found in the reaction and immunogenicity of pigeon pox and fowl pox viruses. Immunity response is also sacrificed in administering the vaccine at so early an age, since it is well established that young birds, as well as the young of other species, do not give a maximum response to antigens. Another factor which undoubtedly has some influence on the antigenic response to the intranasal vaccine is passive immunity, particularly in those chicks carrying relatively high antibody titers. The recommendation for intranasal vaccination of baby chicks has not been made in complete disregard of these influences adverse to antigenic response. It has been made, however, because of the urgency of our present situation which calls for early increased protection of chicks in many chick raising areas and the evidence that intranasal vaccination does give increased protection.

SIGNIFICANCE OF PASSIVE IMMUNITY

Field results have amply shown that in heavily infected areas passive immunity cannot be depended upon for protection up to four weeks of age. Levine and Fabricant (5) have already reported on the failure of passive immunity to protect chicks when the respiratory epithelium is exposed to infection. The following results in this laboratory have substantiated their findings. Pedigreed chicks were hatched from dams immunized by the wing web method with a Massachusetts strain of virus (6) and proved to be immune to Newcastle disease by the SN (serum-neutralization) test. These chicks were challenged at one day of age by intranasal instillation of 0.05 ml. of egg fluids containing the Cal. 11914 strain of virus. The challenge exposures in chicks were made at 18, 23, 27, and 42 weeks following vaccination of the breeding flock. SN tests were made on the dams each time prior to the saving of the eggs for hatching to see if a correlation could be established between SN titers and resistance of the offspring. Table I gives the results of the observations made for a period of two weeks following the exposure of the chicks, showing in one column the number which died or showed nervous symptoms and in the second column the number which manifested the afore-mentioned symptoms plus those showing respiratory symptoms. Some chicks from each group were exposed to infectious bronchitis after their recovery to exclude the possibility that the respiratory symptoms shown were due to bronchitis.

It is apparent from these data that passive immunity was very inadequate in its protection and that there was a decrease in the protective value of passive immunity as time elapsed from the date of immunization of the parent stock. It was observed that chicks from the same dam varied as to their resistance or susceptibility and only those chicks coming from dams showing ten million serum neutralizing doses for NCD virus appeared to be completely refractory. Chicks from dams possessing one million neutralizing doses were not all assured protection.

These data, plus the field evidence leave no doubt that a control program will necessitate the earliest possible immunization to protect many flocks in heavily
infected areas. Sanitary precautions in certain regions cannot be carried out to a degree that will prevent early infection. Day-old intranasal vaccination, however, has enabled many poultrymen to prevent severe losses from the disease and though this may not be the ideal time for the greatest measure of efficiency, the rapidity with which the infection may establish itself in a flock leaves no choice but to administer the vaccine at the earliest age possible.

**VACCINATION OF LAYING FLOCKS**

The feasibility of using the intranasal vaccine in laying flocks has been presented in previous publications (1, 3, 4). Continued study of the vaccination of laying flocks during the past year has confirmed its applicability in such cases without causing a severe drop in egg production. It has been used to aid the control program in laying flocks in the following circumstances: (a) for the immunization of laying flocks which have not been previously immunized but are threatened with infection at the time of initiating a live virus vaccination program in the young stock, (b) for the immunization of laying flocks not previously vaccinated which are menaced by infection in nearby pens or premises, (c) for the purpose of checking egg production losses in previously vaccinated flocks which suffer a "break" in their immunity.

The following observations have been noted in respect to the intranasal vaccination of 12 laying pens. Birds in the period of ascending production show the least drop, but production may remain static for about two weeks following vaccination. Birds in the peak of production usually show a drop in production of approximately 10 to 20 per cent which appears around the seventh to the ninth day post vaccination. Three of the 12 pens showed a greater drop in production, but all three were on premises in which a natural outbreak was occurring and it is believed natural infection may have been established prior to the development of immunity. Vaccination of flocks already showing respiratory symptoms is of no apparent value, but outbreaks have been checked in a flock by immediate vaccination of pens not yet showing symptoms.

The application of intranasal vaccination to check "breaks" in previously vaccinated flocks was attested in a large breeding flock during the past year. The flock was vaccinated by the wing web method with a commercial vaccine during the

<table>
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<tr>
<th>TIME ELAPSED FROM DATE OF ADULT VAC.</th>
<th>NO. CHICKS CHALL.</th>
<th>DIED OR NERVOUS SYMPTOMS</th>
<th>SYMPTOMS OF ALL TYPES</th>
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<tr>
<td></td>
<td>Fraction</td>
<td>%</td>
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</tr>
<tr>
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<td>23</td>
</tr>
<tr>
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</table>
THE INTRANASAL VACCINE

summer of 1949. In February a respiratory disease appeared in some pens of the flock which was diagnosed as NCD by virus isolation early in the outbreak. Blood samples taken from 201 birds in pens not yet affected revealed that 31 per cent were negative to the HI (hemagglutination-inhibition) test. Thirty-eight pens which were not showing symptoms at the time were revaccinated immediately with the intranasal vaccine. Two of the pens which were adjacent to the pens with the natural outbreak showed a drop in egg production similar to the nonvaccinated pens. This drop appeared commensurate with the percentage of HI negative tests in the flock. The other 36 revaccinated pens showed no significant drop in production. Five weeks after revaccination 200 blood samples were taken from pens which had experienced the natural infection and 200 samples were taken from the revaccinated pens. All samples from the naturally infected pens gave a positive HI test and all but one of the 200 samples from the revaccinated pens were positive. One hundred of these latter samples were from the same pen, which, prior to revaccination, had shown 31 per cent negative tests.

Virus isolation from eggs laid by vaccinated hens has been attempted in one flock only. Two dozen eggs were saved on each of ten successive days immediately following vaccination. The yolk sacs from six eggs were pooled in a sterile bottle containing glass beads. Five milliliters of broth were added and the contents thoroughly shaken. Inoculation of the various pools was made into three embryos each. The vaccine virus was recovered from one of the four pools on the sixth day, from two of four pools on the seventh day and from one of four pools on the eighth day post vaccination. All other pools were negative. Twenty-five random blood samples taken from this particular flock 95 and 159 days post vaccination gave 95 per cent positive SN tests at each sampling. Fifteen samples taken 264 days post vaccination gave 100 per cent positive tests.

IMMUNIZATION OF CHICKS

At the present time the effectiveness of the intranasal vaccine administered to baby chicks from immune stock is difficult to evaluate on the basis of current serological tests. Results of the HI and SN tests have been highly variable from flock to flock and do not appear to be a reliable measure of the effectiveness of the vaccine. Results with the intranasal vaccine make it highly questionable that a bird's resistance to disease should be measured only in terms of humoral immunity. Doll (1), in his work with the B1 strain of virus, found that birds which had been vaccinated intranasally rapidly lost their HI titers but still retained the ability to exhibit an anamnestic response following reexposure.

In anticipation that this might be used as a means of verifying the incidence of "takes" in intranasally vaccinated flocks, HI tests were run on the fifth, sixth, seventh, and eighth days following intranasal challenge with Cal. virus 11,914 on birds from field vaccinated flocks. These chicks possessed passive immunity at the time of vaccination. The alpha procedure of the HI test was used and a 1:40 serum dilution was employed following the procedure described by Fabricant (2). The birds selected for challenge were vaccinated at various ages between one and 42 days of age and were challenged at varying intervals after vaccination from 14 to
78 days post vaccination. Of 130 birds which were subjected to the above tests 44 or 33.8 per cent gave a positive HI test prior to challenge and 86 or 66.2 per cent were negative. Of the 86 birds HI negative prior to challenge, 74 or 86 per cent were positive on or before the sixth day post challenge. In similar tests run on 26 control nonvaccinated birds not one gave a positive HI test on the sixth day post challenge. As was noted by Doll (1), not only did the titers of the vaccinated birds appear earlier but the titers were of a higher level. Vaccinated birds which did not show a positive test on the sixth day post challenge usually gave a low level titer on the eighth day comparable to those shown by nonvaccinated birds. Birds which possessed low positive HI titers at the time of challenge exhibited marked increases in their titers by the sixth day post challenge. This increased antigenic response of intranasally vaccinated chicks to challenge exposure seems to be quite consistent and may be the chief factor in the increased resistance of the vaccinated chicks. In the birds tested there appeared to be no significant advantage in the age vaccinated as to the ability to initiate the conditions for the anamnestic response. Making an HI test on the sixth day post challenge may be of value in determining the response of intranasally vaccinated chicks in the absence of other positive indications. It is too time consuming, however, to be of much value except in experimental studies.

The absence of humoral antibodies in many intranasally vaccinated chicks has created some skepticism as to the immunogenic value of the vaccine. If judged purely upon the basis of humoral antibodies, then intranasal vaccination of baby chicks should be condemned as an unsatisfactory procedure. Intravenous challenge, which primarily measures the protective ability of humoral antibodies, gives very disappointing results when attempting to evaluate the immunity of intranasally vaccinated chicks. In conjunction with the afore-mentioned work of determining the anamnestic response of intranasally vaccinated chicks, 110 birds between 39 and 77 days of age were challenged intravenously with 500 chick lethal doses (titrated in 6-week-old chicks) of the Cal. 11,914 strain of virus. Eighty per cent of these manifested nervous symptoms as a result of this challenge. Apparently other factors are involved in giving chicks increased resistance to NCD following intranasal vaccination, one of which may be the establishment of tissue immunity in the respiratory epithelium. Obviously if such a factor plays a part in giving the birds protection against the natural infection, intravenous challenge by-passes this first line of resistance. On the other hand, when this first line of resistance is attacked, as is the case in natural exposure, the bird's defenses are stimulated to greater activity as is manifested by the anamnestic response. Although this is a hypothetical explanation of the action of the intranasal vaccine, observations noted while working with the vaccine have led to the conclusion that increased resistance of the chicks is due to factors other than humoral antibodies, and that the value of the vaccine should not be evaluated solely on the basis of humoral antibodies.

Studies with the intranasal vaccine have provided other information which may throw some light on the reasons for some of the failures of our control program with the wing web method of vaccination. In the preliminary studies with the B1 strain of virus (3), it was learned that the wing web or "stick" method did not produce as satisfactory immunity in baby chicks as the intranasal method. More recently, additional comparative studies of these two methods in older birds have confirmed
the greater effectiveness of the intranasal method over the wing web method. Two trials were made using 14-week-old birds. In each trial one-half of the birds in each lot was vaccinated by the “stick” method using two needles dipped in undiluted allantoic fluid containing the B1 virus. The other half of the birds was vaccinated by intranasal instillation of approximately 0.025 ml. of allantoic fluid. Eight weeks following vaccination, serum samples were taken for HI and SN tests and all birds were subjected to an intravenous challenge of 0.5 ml. of allanto-amnionic fluid containing the Cal. 11914 strain of virus. Table II gives the results of these two trials. In Trial I, the 11 intranasally vaccinated birds were all positive to the SN and HI tests and all survived challenge. In the 11 “stick” vaccinated birds only 3 were positive to the HI and SN tests and only 3 survived challenge. In Trial II, in which 14 birds were vaccinated intranasally, 11 and 13 were positive to the HI and SN tests, respectively and 12 of the 14 survived the challenge. In the 14 “stick” vac-

<table>
<thead>
<tr>
<th>ROUTE INOC.</th>
<th>NO. BIRDS</th>
<th>HI TEST</th>
<th>SN TEST</th>
<th>SURVIVED CHALLENGE</th>
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<tr>
<td></td>
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<td>11</td>
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<td>“Stick”</td>
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<td>Controls, non-inoc.</td>
<td>4</td>
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</table>

IN = intranasal.

The evidence seems unequivocal that a virus of low virulence cannot be applied in minute quantities to an alien tissue to get the same favorable immunogenic response as when applied by the natural route of infection. Since the commercial wing web vaccines are produced from strains with relatively low pathogenicity, the above evidence might serve as the explanation for many of the “breaks” in “stick” vaccinated flocks. Levine and Fabricant (5) have already suggested that the “stick” method into the wing web may not be the best method for administering the Newcastle live virus vaccines and the above evidence would lend support to that opinion. Van Roekel et al. (6) first adapted the “stick” method to the application of Newcastle vaccine using a slightly more virulent strain of virus than is used in the commercial vaccines. Whether it is degree of virulence alone or other factors which permits some strains to be applied by the “stick” method is not known. Two flocks which were immunized by the “stick” method with the same strain of virus originally reported by Van Roekel (6) have been tested by the SN test at intervals during the past year and both were found to be solidly immune at
the last tests made 43 and 38 weeks from date of vaccination, respectively. According to present evidence it seems apparent that the "stick" method of applying vaccines needs a more critical evaluation before vaccination failures can be attributed solely to improper administration.

**DISCUSSION**

Events of the past relative to our control program for NCD leave little doubt that we are a long way from attaining solid protection in birds from the day of hatching until marketing by one application of a vaccine. For replacement stock it seems possible that we may more nearly approach our goal of lifelong immunity by a combination of intranasal vaccination of the low virulent strain of virus in chicks followed by a more potent virus during the growing period. There are some persons who feel that the immunizing properties of the killed virus vaccines have been improved considerably since their inception and if so, perhaps these should be given more consideration in a vaccination program in which the killed virus is used in young chicks followed by live virus vaccination during the growing period. At present there appears to be no justification for recommending repeated vaccination in broiler flocks.

In conclusion, the intranasal vaccine fills an important need in protecting very young chicks and laying stock against the losses from Newcastle disease. Since all our NCD vaccines have certain limitations there seems to be no justification for condemning vaccines because of the so-called "breaks" or failures to give perfect and lifelong immunity. Durable immunity with one application of a vaccine apparently has been set as our goal, but perhaps we may have to revise our ideas as to what degree of flock protection constitutes an acceptable control of the disease. However, our efforts should continually be directed toward overcoming these deficiencies whether it be by a combination of vaccines, by better methods of administration, or by continued search for strains of virus which will give greater protection with a minimum of systemic reaction.

**REFERENCES**


OBSERVATIONS ON THE RELATIONSHIP OF PASSIVE IMMUNITY TO RESPONSE FOLLOWING INTRANASAL VACCINATION AGAINST NEWCASTLE DISEASE

FLOYD S. MARKHAM, PH.D., C. A. BOTTORFF, D.V.M., AND L. B. TENNISON, JR., D.V.M.

Lederle Laboratories Division, American Cyanamid Company, Pearl River, New York

One of the questions frequently raised in connection with the recently introduced Newcastle disease intranasal vaccine (1, 2) is whether or not it is necessary to delay vaccination until the passive immunity of the baby chicks has disappeared. To delay vaccination for 7 to 10 days, as is the practice in some sections of the country, is to sacrifice two of the advantages offered by this type of vaccine, namely, economy of handling and early establishment of immunity. Brief consideration of some of the basic factors in passive immunity may help to evaluate this rule-of-thumb practice.

The immune status of baby chicks is determined by that of the parent stock. The progeny of non-immune layers will certainly be non-immune, but it should be recognized that the progeny of immune layers may or may not have an appreciable degree of passive immunity. There is a rather direct correlation between the blood level of antibody in the laying hen and the amount of antibody found in the yolk fluid (3). Eggs laid when blood antibody levels are at their highest, i.e., shortly after immunization either by natural infection or vaccination, should give rise to chicks with a correspondingly high degree of passive immunity, while eggs laid by hens that are well past their peak antibody levels will give rise to chicks with little or no passive immunity, although the parent stock may still be resistant to infection. In the field, all possible degrees of passive immunity will be encountered. Hence, it would appear that a delay in vaccination which suffices to dissipate one degree of passive immunity may be wholly inadequate or unnecessary in others.

The observations recorded below, while incomplete and based on relatively small numbers, are of interest and indicate what may be expected under the conditions described.

PRELIMINARY OBSERVATIONS

Six-day-old chicks were obtained from a source known to obtain its eggs from an immune flock. On the day of arrival, groups of 25 chicks were given intramuscular doses of virulent field virus (Isele strain) representing 10, 100, 1,000 or 10,000 embryo LD₅₀ doses. The over-all mortality in the 100 birds was 47 per cent, and the range was 36 to 56 per cent. On the day of arrival, when slightly more than half of the birds were demonstrated to be able to withstand challenge with virulent virus, another 100 of these birds were vaccinated intranasally with an experimental vaccine prepared from the Blacksburg, or Hitchner, strain of Newcastle disease virus. Similarly, one hundred 4-day-old chicks from known susceptible stock were vaccinated with the same preparation. Two weeks after vaccination all of the vaccinated birds plus groups of 30 controls were challenged intramuscularly. The results
summarized below are expressed as per cent survival:

<table>
<thead>
<tr>
<th></th>
<th>Vaccinated</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immune stock birds</td>
<td>77 per cent</td>
<td>33 per cent</td>
</tr>
<tr>
<td>Non-immune stock birds</td>
<td>74 per cent</td>
<td>17 per cent</td>
</tr>
</tbody>
</table>

The difference in response in the immune and non-immune chicks is slight and of doubtful significance. Unfortunately, the observations on this experiment did not include HI titers on the immune stock birds at the time of vaccination.

Subsequently, two-day-old chicks from a different immune source were employed for another purpose. The supply flock in this case was maintained on a diet deficient in the animal protein factor (APF) in order to provide chicks for vitamin assay work. The layers had been immunized against fowlpox, laryngotracheitis, infectious bronchitis and Newcastle disease. A pool of serum prepared from 12 chicks bled by heart puncture had a hemagglutination inhibition (HI) titer of 1:512. A group of these two-day-old chicks was vaccinated intranasally with a commercial vaccine (Lot 229a). Three weeks after vaccination, nine vaccinated birds were bled for HI titers; seven were negative, one was positive at 1:4, and one at 1:8, while eight unvaccinated controls bled at the same time were uniformly negative. On this date (21 days after vaccination) six vaccinated chicks and 11 unvaccinated controls, none of which had been bled, were challenged intranasally with a 1:1000 dilution of the Boney strain of Newcastle disease virus. This challenge virus had an embryo LD_{50} titer of 10^{-4.46} and an LD_{50} titer of 10^{-4.1} in four-week-old birds. All of the 11 unvaccinated controls and one of the six vaccinated chicks died. Five weeks after vaccination, four of the vaccinated birds which had survived bleeding at the time of the three-week challenge plus 27 unvaccinated controls were given the same challenge dose administered at the three-week interval. All of the vaccinated birds survived without symptoms. All 27 controls developed Newcastle disease and 24 of them died.

These observations again indicated that passively immune chicks, with HI titers as high as 1:512 at the time of vaccination, were successfully protected against severe challenge following intranasal vaccination. An experiment was therefore designed which, it was hoped, would provide more detailed, quantitative information.

**INTRANASAL VACCINATION OF PASSIVELY IMMUNE CHICKS AT DIFFERENT AGES**

**Supply Flock:** Laying birds of two ages composed the flock. One group had been wing-web vaccinated in July 1948 and the other in February 1949. Blood samples obtained from nine birds in February 1950 had HI titers which, it was considered, were far too high to represent the result of vaccination 12 to 18 months previously. Although there was no history of lowered egg production characteristic of Newcastle disease, it was assumed that these birds had been recently exposed to the disease and that a booster response was being observed. Eggs obtained from this flock of layers were hatched on May 1, 1950.

**HI Titrations:** Blood samples obtained by heart puncture were titrated for HI antibody by a method which is an adaptation of the Salk (4) test widely used in
human influenza studies. Serum samples were diluted in eight-unit virus and combined in equal amounts with 0.25 per cent chicken red blood cells.

Groups of normal unvaccinated birds were bled on May 1, 3, 5, 10, 15, 19, 23, and June 2. The observed titers are recorded in Table I as the number of birds over the attained titer.

**Intranasal Vaccination and Challenge:** On May 1, 3, 5, 10, and 15, when birds were removed from isolation for bleeding, others were vaccinated intranasally with commercial vaccine (Lot 207) and placed in separate isolation quarters to await challenge. Birds were not rebled and none that was bled was subsequently vaccinated.

Because of the rapid rate of decline in HI titers which was evident by the end of the second week, it was assumed that the passive immunity would be dissipated by the end of the third week, and hence, that unvaccinated birds would be susceptible to challenge. On May 23, those chicks vaccinated on May 1, 3, and 5, were given Boney virus in a dilution of 1:1000, either 0.05 cc. intranasally or 0.25 cc. intramuscularly. The results are shown in Table II. The fact that all of five normal unchallenged controls bled on the day of challenge still had demonstrable antibody (see Table I, May 23) doubtless explains the failure of 78 per cent of the controls to come down on challenge. Three of the four paralyses or deaths recorded among the vaccinated birds occurred on the ninth day or later; in fully susceptible birds most of the morbidity and mortality appears between the fourth and sixth days post-inoculation. Neither of the affected controls died and only one had any residual paralysis.

On June 2, the groups of birds vaccinated on May 10 and 15 were challenged intramuscularly with Boney virus in a dilution of 1:1000. At this time a few birds in each of the vaccinated groups and the normal unvaccinated controls were bled for HI titers. The serologic findings and the results of challenge are shown in Table III. There was one death, on the fourth day post-challenge, among the birds vac-

### Table I

**Hemagglutination-inhibition Titers in Passively Immune Chicks at Various Intervals After Hatching**

<table>
<thead>
<tr>
<th>Date of Bleeding</th>
<th>Number Tested</th>
<th>Number of Chicks with Indicated Titer</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1</td>
<td>6</td>
<td>2/1024 2/512 1/256 1/128</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4/1024 3/512 2/256 1/128</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>2/1024 3/512 4/256 1/128</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>4/128 1/64 4/32 1/16</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>3/32 2/16</td>
</tr>
<tr>
<td>19</td>
<td>5</td>
<td>1/64 1/32 2/16 1/8</td>
</tr>
<tr>
<td>23</td>
<td>5</td>
<td>1/32 4/16</td>
</tr>
<tr>
<td>June 2</td>
<td>5</td>
<td>2/8 3/0</td>
</tr>
</tbody>
</table>

* Chicks were hatched May 1, 1950.
† Recorded as the number of birds/the H-I titer.
cinated at ten days of age and, in addition, two others developed paralyses—one on the 14th and the other on the 17th day post-challenge. There were no casualties among the birds vaccinated at 15 days of age. Of the 23 controls, 13 became paralyzed and died. The 44 per cent survival rate among the controls is in

<table>
<thead>
<tr>
<th>DATE OF VACCINATION</th>
<th>DATE POST VACCINATION</th>
<th>CHALLENGE ROUTE*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Inas</td>
</tr>
<tr>
<td>May 1</td>
<td>22</td>
<td>0/10</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>0/10</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>1/10 (9)</td>
</tr>
<tr>
<td>Controls</td>
<td>—</td>
<td>2/5 (10, 10)</td>
</tr>
</tbody>
</table>

* Inas—Intranasal. Im—Intramuscular.
Challenge virus was the Boney strain in a dilution of 1:1000.
Results expressed as the number of birds dying or developing paralysis/the number challenged.
The figures in ( ) indicate the post challenge day on which symptoms appeared.

<table>
<thead>
<tr>
<th>DATE OF VACCINATION</th>
<th>H-I titers*</th>
<th>Results of challenge</th>
<th>H-I titers</th>
<th>Results of challenge</th>
<th>Controls</th>
<th>H-I titers</th>
<th>Results of challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 10</td>
<td>2/32</td>
<td>1/16</td>
<td>1/8</td>
<td>1/0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Results of challenge</td>
<td>3/15 (4, 14, 17)†</td>
<td>2/16</td>
<td>2/8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 15</td>
<td>2/8</td>
<td>3/0</td>
<td>13/23 (2, 4, 4, 4, 4, 4, 4, 4, 5, 6, 6, 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>2/8</td>
<td>3/0</td>
<td>13/23 (2, 4, 4, 4, 4, 4, 4, 4, 5, 6, 6, 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* H-I titers on 6/2/50 the day of challenge are expressed as the number of birds/the H-I titer.
† Figures in ( ) following the morbidity-mortality ratio represent the days on which symptoms appeared in affected birds.

The figures in ( ) indicate the post challenge day on which symptoms appeared.

DISCUSSION

The data reviewed above all indicate that passively immune birds do respond satisfactorily to intranasal vaccination. In the preliminary observations cited, there was no appreciable difference in the response of the passively immune and the non-immune chicks. In the case of the chicks from the APF deficient flock, vaccination was done at the time when the antibody level was relatively high (1:512). The con-
VACCINATION AGAINST NEWCASTLE DISEASE

tROLS had completely lost their passive immunity at the end of the third week and vaccinated birds were shown to be protected at three and at five weeks following vaccination. In the last group described, the antibody levels during the first week were comparable to those of the APF deficient group, yet among the former some unvaccinated birds retained their resistance and titers well into the fifth week. Because the controls failed to come down in satisfactory numbers, owing to their passive immunity, it is not possible to conclude from these data whether or not there is a response in chicks which are vaccinated when the levels of passive antibody are high. However, in the groups vaccinated at ten and fifteen days of age, there was still sufficient passive immunity at the time of vaccination to protect these birds against heavy doses of virulent virus. This was demonstrated by the fact that, in the May 23rd immunity test, the unvaccinated controls withstood potent challenge.

While it seems paradoxical that birds should be resistant to heavy intramuscular challenge with virulent virus and at the same time be susceptible to upper respiratory infection and active immunization with an innocuous strain like the Blacksburg strain of Newcastle disease virus, this situation is paralleled, at least in part, in human influenza. It is worthwhile to recall that circulating antibody does not always mean immunity at the natural portal of entry. It has been shown repeatedly that most adults have circulating antibody for type A influenza virus. During seasons when this disease is prevalent, those who have low titers frequently develop clinical attacks after which their titers are raised to high levels. Attacks are less frequent in those with higher titers, but surveys show that inapparent infections of the upper respiratory tract with influenza virus must take place at various antibody levels (5). Unlike the deeper tissues, the respiratory mucosa is not bathed on all sides by antibody-containing fluids. Theoretically, at least, it seems possible that focal immunizing infections of the relatively naked respiratory mucosa may take place in systemically resistant birds and we are of the opinion that this is what occurs in passively immune chicks when they are vaccinated with the intranasal vaccine.

REFERENCES

INFECTIOUS SINUSITIS OF TURKEYS


Texas Agricultural Experiment Station and School of Veterinary Medicine, College Station, Texas

Infectious sinusitis of turkeys is widespread in this country and appears to be becoming more prevalent in some sections. An increasing number of reports (1, 2, 3, 4, 5) indicate that this disease is caused by a non-bacterial agent which can be propagated in embryonated eggs. Most reports appear to deal with the same disease, but sufficient information is not available at the present time to determine whether the etiological agents mentioned are identical.

Variable results have been reported on the methods of transmission. These reports have been summarized by Jerstad, et al. (9). Transmission by contact has been reported by some investigators (4, 5, 9) while others (10, 11, 12) failed to obtain transmission in this manner.

Recent reports have shown that streptomycin and aureomycin are active against the agent of turkey sinusitis in vitro and in vivo (4, 6, 7, 8). Both antibiotics have been used successfully in treating sinusitis of turkeys under experimental and field conditions.

CHARACTERISTICS OF THE AGENT CAUSING INFECTIOUS SINUSITIS

The method used in isolating and cultivating the agent of infectious sinusitis has been described elsewhere (4). Seven strains of the material have been isolated from field outbreaks of sinusitis. All seven strains have produced a similar pattern when propagated in the allantoic cavity of seven-day embryonated chicken eggs. The typical pattern of growth for two of the strains is shown in Tables I and II. All of the strains studied produced a variable, scattered mortality which occurred from the 3rd to 13th days after inoculation. The lesions in the embryos were not consistent. A dwarfing similar to that which occurs with infectious bronchitis virus has been observed, but this was not a constant finding. Skin, brain and kidney hemorrhage were commonly observed. The mortality pattern and lesions appear similar to that described by Delaplane (3) for the virus of a chronic respiratory disease of chickens and a strain of sinusitis virus obtained from Hitchner of Virginia.

STUDIES ON EGG TRANSMISSION

Jerstad, et al. (13), reported the probable egg transmission of infectious sinusitis. They were successful in isolating the causative agent from eggs from naturally infected hens and reported that poults hatched from such eggs developed sinusitis.

Field observations during the 1949 hatching season suggested the possibility of egg or hatchery transmission. Eight cases of infectious sinusitis were observed in three to four weeks old poults which had originated from the same hatchery. Investigation revealed that at the time these poults were produced two of this hatchery's supply flocks had sinusitis. It was not possible to eliminate the possibility of expo-
### TABLE I

Embryo Mortality Pattern for one Strain (Se.) of Infectious Sinusitis Material

<table>
<thead>
<tr>
<th>PASSAGE NO.</th>
<th>NO. INOC.</th>
<th>DATE 1949</th>
<th>AGE OF EMBRYOS</th>
<th>NUMBER OF EMBRYOS DEAD (days following inoculation)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>5/19</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>5/27</td>
<td>7</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>6/3</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>6/12</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>6/20</td>
<td>7</td>
<td>0</td>
<td>0</td>
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<td>7</td>
<td>6</td>
<td>10/26</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>12/12</td>
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<td>7</td>
<td>1</td>
<td>0</td>
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<tr>
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<td>6</td>
<td>2/26</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>3/20</td>
<td>7</td>
<td>1</td>
<td>1</td>
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<tr>
<td>13</td>
<td>6</td>
<td>8/1</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

k—Killed for harvesting

### TABLE II

Embryo Mortality Pattern for one Strain (Bo.) of Infectious Sinusitis Material

<table>
<thead>
<tr>
<th>PASSAGE NO.</th>
<th>NO. INOC.</th>
<th>DATE 1949</th>
<th>AGE OF EMBRYOS</th>
<th>NUMBER OF EMBRYOS DEAD (days following inoculation)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
</tr>
<tr>
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<td>7</td>
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<td>6</td>
<td>4/24</td>
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<td>9</td>
<td>6</td>
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<tr>
<td>11</td>
<td>6</td>
<td>8/1</td>
<td>7</td>
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<td>0</td>
</tr>
</tbody>
</table>

k—Killed for harvesting

Sterile sinus exudate from inoculated bird
Dwarfing
Remaining eggs unintentionally discarded
Dwarfing
Sinusitis produced in turkeys with a.a. fluid
Sinusitis produced in turkeys with a.a. fluid
sure after leaving the hatchery in all cases, but visits were made to three of the farms and no evidence of exposure to either chickens or turkeys could be found.

Eggs were obtained from one of the affected supply flocks and hatched in an incubator in the laboratory. Ninety-eight eggs were incubated but only 14 poult's hatched. The poult's which hatched were observed for 12 weeks with no evidence of sinusitis. Also, three embryos which died on the 13th day of incubation were harvested and the material (allantoic fluid) was inoculated into embryonated chicken eggs and into the sinus of two susceptible poult's. The egg inoculation failed to indicate the presence of any infectious agent. The two inoculated poult's were observed for 30 days with no indication of infection.

During the 1950 hatching season eggs were obtained from four additional turkey flocks affected with sinusitis. Affected birds were isolated and the eggs were obtained from these birds instead of from the general flock. The number of eggs obtained from each flock varied from 35 to 100. Hatchability was low in each group. This may have been caused by poor incubation, since a small incubator without an automatic turning device was used. Each group of eggs was incubated separately and the poult's were isolated and observed for at least 10 weeks. Material was harvested from embryos which died during the incubation period and used to inoculate embryonated chicken eggs and susceptible poult's.

A total of 326 eggs were obtained from the five flocks and 76 poult's were hatched. No evidence of sinusitis was observed in any of the poult's and attempts to isolate the causative agent of infectious sinusitis from dead embryos by egg or bird inoculations were negative.

Twelve fertile turkey eggs were inoculated via the allantoic cavity with the ninth passage of an egg propagated strain (Se) of sinusitis material on the 20th day of incubation. Five poult's hatched and were observed for 10 weeks with no indication of sinusitis.

IMMUNITY

The prolonged course of infectious sinusitis indicates that the degree of immunity is relatively low or that it develops only after prolonged infection. However, observation of field cases treated with streptomycin or aureomycin indicated that recurrence of symptoms in recovered birds under natural exposure was not significant. This suggested the probability of some immunity.

Four susceptible birds approximately 12 weeks old were inoculated in the right sinus with 1 cc. of a strain of egg propagated material (Bo). All birds were showing a distinct distention of the inoculated sinus four days later. These birds remained infected for 52 days then were treated with streptomycin. All birds responded to the treatment and were apparently recovered after 10 days. Eleven days after treatment the four birds were inoculated in the left (opposite side from the first inoculation) sinus with 1 cc. of the same material used for the first inoculation. All birds again showed a typical distention of the inoculated sinus four days after inoculation.

DISCUSSION

It was not necessary to make blind passages in the original isolation of any of the strains studied. However, in the Se. strain (Table I) no embryos were killed on the
10th passage and it was necessary to make one blind passage. No explanation for this occurrence is given. The Bo. strain (Table II) did not consistently kill as many embryos as the Se. strain and in two instances (9th and 10th passage) it was necessary to destroy some embryos for harvesting.

Although the egg transmission studies do not preclude the possibility of egg transmission, they indicate that only a very small percentage, if any, of the eggs from infected birds are infected. This is substantiated by the fact that hatcheries using eggs from infected flocks usually do not receive complaints of sinusitis in their poult. The one case reported where eight groups of poult from one hatchery were affected is an exception to this observation. The possibility of egg or hatchery transmission requires further study and the data presented indicates that such work should be done on large numbers of poult.

**SUMMARY**

The typical pattern of embryo mortality for two strains of a non-bacterial agent causing infectious sinusitis of turkeys is presented in Tables I and II.

Eggs were obtained from infected birds in five flocks, hatched and the poult observed for at least 10 weeks. None of the poult hatched from these eggs developed sinusitis during the observation period. Attempts to isolate the causative agent from embryos which died during the incubation period were negative.

Birds which were inoculated with a strain (Bo) of infectious sinusitis material and allowed to remain infected for 52 days, then treated with streptomycin, were still susceptible when challenged with the same strain of material.

**REFERENCES**

A highly fatal respiratory disease occurred on the State Game Farm among native Bobwhite Quail during the summer of 1949. The first hatch came off in April. Very little trouble was present from April to June. By August 24, when the birds were first brought to the laboratory, heavy losses were occurring. The loss in some pens ran as high as 80 per cent.

Colds were present in the 1948 flock, and these birds were saved for breeders. In 1949 coughing and sneezing were present among some of the breeders. This was not present or noticed in previous years. Egg production did not seem to be adversely affected. The loss during 1948 was 4,500 out of 12,700, and during the 1949 season the loss was 13,000 out of 24,000. Chuckar Partridge did not take the disease and nearly 100 per cent of those hatched were raised.

The quail were brooded in pens 3' x 8' x 2'. Eighteen square feet of the area was used for a sun porch. Wire floors were used throughout and feces were collected on a dropping board. The houses were heated by thermostatically controlled electric brooders. New brooders were used in the 1949 season and were about 150 feet from the breeding pens.

Symptoms first occurred at three weeks of age and were described by the manager as colds. Feed consumption was reduced markedly at the start of the symptoms. There was some coughing, sneezing, and rattled breathing. No nasal discharge was noted. Bending of the neck back between the wings or between the legs was noted in 2 to 3 per cent of the birds. Losses in individual pens was 70 to 80 per cent. The disease lasted 1 to 3 weeks.

Birds were submitted again September 12. Autopsy revealed no gross lesions except a thickening of the crop and cloudiness of the cornea in some but not all birds. Unidentified trichomonads were found in the ceca of two dead quail. The intestines were not inflamed. Several were showing nervous symptoms, but only slight respiratory râles were present. A tentative diagnosis of Newcastle disease was given along with a request for additional birds showing marked respiratory symptoms. The hemagglutination-inhibition test was unsatisfactory, but samples of serum submitted to the Bureau of Animal Industry for serum neutralization tests were negative for Newcastle disease. Attempts to recover pathogenic bacteria by the usual methods failed.

Of the additional birds submitted, four with marked respiratory râles were used for virus isolation trials. Mucus was removed from the tracheae and mixed with 5 cc. of nutrient broth to which 100 mg. of streptomycin had been added. This material was inoculated in 0.25 cc. amounts into the allantoic cavity of 8-day em-
bryos. The allantoic fluid was harvested from the dead embryos. The fluid was tested by the red-cell hemagglutination test for Newcastle disease virus and was found negative. Succeeding passages in embryos revealed a marked curling and dwarfing of the embryos as seen with infectious bronchitis virus. No curling of the tarsus was noted. The amnionic sac was thickened and closely wrapped around the embryos. Occasionally the livers had small necrotic foci. The dwarfing started on or about the fourth day, and in most cases the embryos were dead by the tenth day. The virus increased in virulence for embryos. After the eighth passage, all embryos were dead within three to four days. The blood vessels became smaller as dwarfing progressed. The titer of the third passage virus in embryonating eggs was $10^{-7.5}$LD$_{50}$. Sterile allantoic fluid filtered through a Sietz filter produced typical dwarfing when inoculated into the allantoic cavity of eight-day embryos.

**TRANSMISSION TRIALS**

The pattern of growth in embryos suggested that this might be infectious bronchitis virus. However, inoculation intramuscularly and intranasally with second and third embryo passages of the quail disease virus failed to cause noticeable symptoms in day-old and 8-week-old chickens. Ten 5-day-old chicks were challenged intranasally with 0.1 cc. amounts of allantoic fluid of the third passage quail disease virus on August 12. Ten birds were placed in the same pen as controls. On August 19 a slight râle was picked up in one inoculated bird. This bird was sacrificed, and on autopsy a slight amount of mucus was found in the trachea. The mucus was treated as previously described and inoculated into the amnionic sac of five eight-day-old embryos. Typical dwarfing was produced in four out of five embryos. The inoculum and harvested allantoic fluid were sterile. The remaining chicks were challenged intranasally with Van 8 bronchitis virus* three weeks after exposure to the quail disease virus. Typical symptoms of bronchitis were produced and the bronchitis virus was recovered from both the controls and the challenged birds. Further trials on adaptation of this virus to chickens will be tried.

Eleven 4-week-old quail were available for study. Five were challenged intranasally and intramuscularly with 0.1 to 0.2 cc. of third passage quail disease virus. Six were held in the same pen as controls. Owing to cannibalism, one inoculated bird and two controls died on the third, fourth and fifth days, respectively, after inoculation. No mucus was noted in the tracheae of these birds. One inoculated quail died on the seventh day, and 1 inoculated bird and 1 control were sacrificed for virus isolation. The virus was isolated from all three birds.

The symptoms in the artificially inoculated quail were first noted on the seventh day following challenge and was evidenced by coughing, sneezing, and rattled breathing in the controls as well as the challenged birds. A slight nasal discharge was noted in one bird. Autopsy of three chicks at this time revealed a small amount of yellowish mucus in the tracheae. No other lesions were noted, and no pathogenic bacteria were recovered. Autopsy of four survivors 23 days after inoculation revealed a cloudiness in the thoracic air sacs of three birds. No other lesions were noted.

* Van 8 Bronchitis virus was furnished by Dr. J. P. Delaplane, Rode Island Agricultural Experiment Station, Kingston, Rhode Island.
One survivor from the above quail (two months after challenge) and one quail from the 1949 hatch were challenged with the third passage quail disease virus intranasally. These birds were observed for one month and no symptoms were noted.

Four four-week-old quail from a later hatch were also available for study. These were challenged intranasally with 0.1 cc. amounts of quail disease virus. Symptoms were first noted 4 days after challenge and were similar to the first group. Two quail were sacrificed for virus isolation trials seven days after exposure. No lesions were found in one. The other had a slight amount of clear mucus in the trachea and cloudy thoracic air sacs. The results of the virus isolation are not yet available.

Three eight-week-old turkeys were challenged with 0.25 cc. amounts of third passage quail disease virus intranasally and intrasinusly. Two birds were held as controls. A slight nasal discharge, coughing, and sneezing were noted five days after challenge in the controls as well as in the inoculated group. One control and one inoculated bird were sacrificed for virus isolation trials six days after challenge. A virus isolated from both groups caused typical dwarfing in embryos.

A retrial on five, four-week-old turkeys, challenged with 0.1 cc. of third passage quail disease virus intranasally and intrasinusly, produced no symptoms during a one-month observation period, other than a slight rale in two birds seven days after challenge. These birds were sacrificed for virus isolation which was not successful. The three survivors and two controls were challenged with the agent isolated from the first trial. A slight nasal discharge was produced in four days and continued for five days. No coughing or sneezing was present. No virus isolations were attempted.

Quail virus neutralization tests were attempted on serum from inoculated birds before and after challenge with the unknown virus. Bronchitis and Newcastle disease antiserum were also tested. The test was not quantitative enough to be significant. An insufficient supply of serums prevented a rerun of this test.

**DISCUSSION**

The pattern of growth in embryos and the symptoms produced in quail suggested a virus similar to infectious bronchitis of chickens. The lack of development of immunity to infectious bronchitis and the inability to readily produce the disease in chickens fails to establish this relationship. Although it was not evident in this trial, the possibility that cross immunity may exist between the quail disease virus and infectious bronchitis should not be overlooked. Also, there may be types of virus, such as that in human influenza, in which little or no cross immunity exists (1). The serum neutralization test with bronchitis antiserum was not quantitative enough to be greatly significant. Similar results were reported by Hanson (2).

A similar disease in quail was reported by Levine (3) in New York in 1933. The disease was described as infectious sinusitis similar to infectious sinusitis (bronchitis) of chickens. The successful immunization of day-old chicks by inoculation of the cloaca with vaccine was reported.

The same or similar virus of quail was isolated by Beaudette (4) in 1939. The incubation period of this disease in quail was four to seven days. The results
of the turkey experiments indicated a laboratory infection on the first trial. Isolation of the quail virus from one chick in one trial would indicate that this virus may be adapted to chickens. The fact that this agent was filterable and was not killed by streptomycin would tend to place it in the virus group of diseases.

Recovered birds were apparently immune to artificial exposure. The fact that some of the breeders contracted the infection indicates that the immunity may not be permanent or that the infection was not present in the 1948 season. The low virulence of this virus for artificially inoculated quail suggests that the egg propagated virus might be used for immunization purposes.

**SUMMARY**

1. A disease of quail caused by virus is described. The disease produced a high mortality and respiratory symptoms similar to infectious bronchitis of chickens.

2. The virus was recovered only in the early stages of the disease. Inoculation into embryos produced dwarfing in four to eight days and usually death by the tenth day. The virus became more virulent for embryos on succeeding passages.

3. The virus failed to produce red-cell hemagglutinins.

4. Serum neutralization tests with bronchitis antiserum gave inconclusive results.

5. The egg-propagated virus produced a disease in quail similar to the natural infection.

6. Turkeys and chickens were refractory to infection. The virus was isolated from one chick seven days after challenge.

7. The possibility of cross immunity and/or different types of bronchitis virus is pointed out.

**BIBLIOGRAPHY**


2. HANSON, R. P. Personal communication

3. LEVINE, P. P. Personal communication

4. BEAUDETTE, F. R. Personal communication
SIGNIFICANT OBSERVATIONS IN PULLORUM DISEASE ERADICATION


Department of Veterinary Science, Massachusetts Agricultural Experiment Station, Amherst, Mass.

For the past three decades some states and in more recent years other states, have made a concerted effort to eradicate pullorum disease from their breeding flocks. Pullorum infection has been reduced markedly or eliminated completely from flocks in many states. The adoption of reliable testing programs and effective eradication measures definitely has mitigated the losses from pullorum disease in this country. However, to attain further progress in the control and eradication of the disease, all states should scrutinize their methods of attack in order that more effective measures may be instituted. It is the purpose of this paper to discuss some items that play an important role in the eradication of the disease from flocks.

EFFECTIVE DIAGNOSTIC DILUTION

The success in establishing and maintaining flocks free of pullorum disease is in a large measure dependent upon the use of a reliable testing procedure. The effectiveness of the testing procedure in detecting infected birds is greatly influenced by the diagnostic dilution employed. In the early days of pullorum disease testing, the serum-antigen dilutions 1:50, 1:100, and 1:200 were commonly employed for diagnostic purposes. However, with the development of testing programs and the study of reacting birds, it was soon revealed that serums from pullorum infected birds may exhibit a wide range in agglutinating titers. Furthermore, the agglutinating titer may vary and fall below the diagnostic dilution employed. Dearstyne, Greaves, and Gauger (1) observed that among 5,053 reacting birds, detected in commercial flocks, 26.8 per cent were intermittent reactors. Other investigators (4) have made similar observations. The evidence shows, without question, that pullorum infected birds do not always maintain static agglutinating titers and, in some instances, no agglutinating substances may be detectable in the serums. On the basis of this knowledge a diagnostic dilution, not to exceed 1:50, has been adopted by the National Poultry Improvement Plan for the testing of chickens.

The use of a diagnostic dilution within the range of 1:25 and 1:50 has brought the criticism that too many non-specific reactions are detected in pullorum negative birds. While this complaint may have some merit, one cannot justify employing a higher dilution which will fail to detect low titered infected birds. It is quite apparent that it is more important to detect all infected birds, even though some non-pullorum reactors may be detected. This policy has been recognized in routine pullorum testing in Massachusetts for the past 23 years.

Contribution No. 774 from the Department of Veterinary Science, Massachusetts Agricultural Experiment Station, Amherst, Mass.

175
During the past 23 years reacting birds have been submitted to the laboratory for necropsy as a diagnostic aid to the tube agglutination test (1:25 dilution) as used in the routine testing of flocks for pullorum disease. Blood samples from the reacting birds were collected at the time of necropsy and the serums were tested in multiple dilutions starting with the 1:10 dilution. Bacteriologic examinations were made at the time of necropsy.

<table>
<thead>
<tr>
<th>SEASONS</th>
<th>FLOCKS</th>
<th>NUMBER OF INFECTED BIRDS</th>
<th>AGGLUTINATION TITERS</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>1927-28</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>1928-29</td>
<td>15</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>1929-30</td>
<td>17</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>1930-31</td>
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<tr>
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<td>34</td>
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<td>1948-49</td>
<td>13</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>1949-50</td>
<td>19</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>334</td>
<td>561</td>
<td>2</td>
</tr>
</tbody>
</table>

* One turkey tested in 1:25, 1:50, 1:100 dilutions gave reaction of 1 in 1:100 dilution.

In an analysis of the data only the reacting birds from which S. pullorum was isolated will be discussed in this paper. Table I gives a 23-year summary of 561 infected birds submitted from 334 tested flocks. The infected birds are classified by years according to their agglutination titer. Among the 561 infected birds, two had a titer of less than 1:10; two a titer of 1:10; four a titer of 1:20; 31 a titer of 1:40; 74 a titer of 1:80; and the remainder a titer of 160 or higher. The majority of birds revealed a titer in the 1:160 to 1:1280 range. It should be emphasized that 113 (20.14 per cent) of the 561 birds exhibited a titer of 1:80 or less which is highly significant from a practical standpoint. Furthermore, 39 (6.95 per cent) of the 561
birds had a titer of 1:40 or less. Only eight (1.42 per cent) of the 561 birds exhibited a titer of 1:20 or less at the time of necropsy.

These results show that the 1:25 dilution is significantly more effective in detecting infected birds than the 1:80 or higher dilutions. The reliability of a test in detecting infected birds is exceedingly important in flocks which may contain only one infected bird possessing a low titer. In such instances if the infected bird is not detected and the flock is given a pullorum clean rating, it may become a serious menace by contaminating a hatchery or re-infecting other pullorum clean flocks through the sale of eggs and stock. In our experience the 1:25 dilution has been very effective in detecting pullorum "breaks" with only one or two infected birds of which some were classified as doubtful reactors. Early detection of these infected birds has in most cases prevented the spread of the disease to hatcheries or other flocks. The importance of early elimination of all infected birds from a flock cannot be emphasized too strongly and the employment of an effective diagnostic dilution is most essential.

Relative to the use of the whole blood test, one should recognize that the blood and antigen dilution is important. A deviation from the amounts recommended for the test may lead to faulty results and interpretation. As with the tube test, infected birds with low titers may not be detected if the test is improperly conducted.

**STANDARD AND VARIANT ANTIGENS**

The significance of variant infection was first called to our attention a decade ago. This aspect of the disease has attracted considerable attention from some investigators. Many states agencies (2) engaged in pullorum disease testing are also recognizing this problem. Reports of testing results reveal that the incidence of variant infection may vary widely in different localities in this country. In the New England area variant pullorum infection is detected rarely, whereas in the Midwest, one state (5) reported that 30 per cent of all pullorum cultures isolated were of the variant type. More knowledge about the seriousness of the problem would be gained if diagnostic laboratories would type the cultures isolated from pullorum reactors or from diseased specimens received for examination. In the examination of reacting birds, it is recommended that the proposed minimum standard for the bacteriologic examination of pullorum reactors incorporated in the National Poultry Improvement Plan be followed.

To combat this problem more effectively, it is apparent that improved antigens are needed for routine testing. It is hoped that a constructive investigational program on this problem can be conducted in this country.

**INTENSIVE RETESTING**

Eradication of pullorum infection from breeding flocks may be accomplished through short interval retesting. Hinshaw, Sanders, and Dunlap (3) first advocated testing infected flocks at four-week intervals until all infection had been completely eliminated. Through such a program of testing many pullorum clean flocks were established. The number of tests required to eliminate the infection from a flock depends upon a number of factors, among which the application of a reliable testing method appears to be the most important. The amount of infection in the flock, size
of the flock, environmental conditions on the farm, adoption of a sound sanitary program and the cooperation received from the flock owner are other factors which play a role in the successful elimination of infection from flocks. An intensive retesting program involving several tests is time-consuming and costly. Intensive retesting should not be started in a flock unless the flock owner has definitely decided to carry out the program to completion. Little or nothing is gained if the amount of infection is reduced to a minimal degree. Permitting one or two infected birds to remain in the flock may lead to heavy infection among the progeny the following year.

In areas with many infected flocks, it is proposed that the better breeding flocks be selected for such a program and they in turn can supply replacements for other flocks which do not warrant the expense of retesting. By adopting a program which combines intensive retesting and the selection of replacement stock from officially recognized pullorum clean sources rapid progress can be made in establishing and maintaining pullorum clean flocks. Hatcherymen and flock owners should seek the advice and guidance of sanitary officials regarding the programs they wish to institute.

In the New England area, a negligible amount of intensive retesting is carried on in flocks showing an appreciable amount of infection. Retesting is largely confined to flocks that have experienced a "break" and in which the amount of infection is small. When heavily infected flocks (two per cent or higher) are discovered, the owners are advised to liquidate the flock at the most opportune time and select replacements from officially recognized pullorum clean flocks. This procedure has proved very effective in establishing pullorum clean flocks and also it is less costly.

It is the opinion of the authors that in areas where pullorum disease is still widespread a program of selected intensive retesting plus extensive replacement of infected flocks with pullorum clean stock would result in the successful establishment and maintenance of pullorum clean flocks.

**OCCURRENCE OF "BREAKS"**

The establishment of a pullorum clean flock is an essential step in an eradication program, but to maintain a flock free of the disease is even more important and more difficult. It should be recognized that the results of an effective testing program may be nullified if the flock owner does not observe effective pullorum disease preventive measures. However, it appears that in certain instances flocks become re-infected for reasons beyond the apparent practical control of the flock owner. The problem of "breaks" has been disconcerting to the flock owner, hatcheryman, testing laboratory and regulatory agency.

In reviewing the testing results for the past thirty years, it is revealed in Table II that among 338 flocks tested in 1949–50, 216 had a testing history ranging from three to 21 consecutive years. In no instance was pullorum infection detected during the period of consecutive annual testing. However, the majority of flocks had less than 10 consecutive years of testing. Forty-six flocks had been tested for more than 10 consecutive years. The remainder of the flocks, 122 or 36.2 per cent, revealed infection as follows: 73 flocks one year, 27 flocks two years, 11 flocks three years, seven flocks four years, one flock for each of five and six years, and two flocks for
eight years. It is evident that the flocks with the longer testing histories have a
greater number of years of infection than those flocks with shorter testing periods.
Among the 38 flocks tested for 21 consecutive years, 29 revealed infection from
one to eight years during this period. A summary of the time of occurrence of the
infection in the testing histories of the 29 flocks is given in Table III. Fifteen flocks
revealed infection for only one year. It is interesting to note that among some flocks
with two or more years of infection, an interval of ten years occurred between the

### Table II

**Consecutive Years of Testing and Years of Infection for Flocks Teste in 1949–50**

<table>
<thead>
<tr>
<th>YEARS OF CONSECUTIVE TESTING</th>
<th>NUMBER OF FLOCKS</th>
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<tr>
<td>21</td>
<td>38</td>
<td>9</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>338†</strong></td>
<td><strong>216</strong></td>
</tr>
</tbody>
</table>

* Infection appeared in six flocks following partial negative tests.
† Percentage of flocks revealing infection was 36.2.

infection years. The foregoing data reveal that flocks once free of the disease can
remain so for a long period and also some flocks may experience infection repeatedly.
During the past 20 years of testing 218 “breaks” (5.12 per cent) were observed
among 4,257 flocks tested. Table IV shows that the number of “breaks” fluctuated
during the 20 years with a low incidence during the years 1940–1942, inclusive,
followed by a rise during the war years. The increase in the number of “breaks”
during the war years might be explained by the fact that adequate preventive meas-
ures were not observed because of inadequate help, feed, equipment and the demand
for increased production. During the post war years, the incidence of “breaks”
declined except for this past year when there was a significant increase.

The percentage of infection detected on the first test for “break” flocks varied
TABLE III
The Frequency and Time of Occurrence of Infection in the Testing Histories of 29 Flocks

<table>
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<th>TESTING PERIOD</th>
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<td>A1*, B1, C2, D1, E1</td>
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<td>I2, J2</td>
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<td>N3</td>
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<td>0</td>
<td>M1</td>
<td>N1</td>
</tr>
<tr>
<td>16-21 years.......</td>
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<td>F1</td>
<td>J2, K4</td>
<td>L4</td>
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<td>N1</td>
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<td>Totals ............</td>
<td>15</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* Flocks with two or more years of infection have been identified with a letter and the years of infection are indicated by numerals.

TABLE IV
Pullorum “Breaks” Among Negative Flocks for Twenty-Year Testing Period

<table>
<thead>
<tr>
<th>SEASON</th>
<th>NUMBER OF 150 PERCENT NEGATIVE FLOCKS</th>
<th>“BREAKS”</th>
<th>PERCENT OF INFECTION ON FIRST TEST BY FLOCKS</th>
<th>NUMBER OF TESTED FLOCKS</th>
<th>NUMBER OBTAINING ONE OR MORE NEGATIVE TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930-31</td>
<td>101</td>
<td>9</td>
<td>8.91</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1931-32</td>
<td>54</td>
<td>7</td>
<td>12.96</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1932-33</td>
<td>75</td>
<td>7</td>
<td>9.33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1933-34</td>
<td>98</td>
<td>12</td>
<td>12.24</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1934-35</td>
<td>108</td>
<td>9</td>
<td>8.33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1935-36</td>
<td>112</td>
<td>7</td>
<td>6.25</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1936-37</td>
<td>130</td>
<td>6</td>
<td>4.62</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1937-38</td>
<td>159</td>
<td>6</td>
<td>3.77</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1938-39</td>
<td>182</td>
<td>10</td>
<td>5.49</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1939-40</td>
<td>200</td>
<td>6</td>
<td>3.00</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1940-41</td>
<td>198</td>
<td>5</td>
<td>2.53</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1941-42</td>
<td>212</td>
<td>6</td>
<td>2.83</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>1942-43</td>
<td>249</td>
<td>13</td>
<td>5.22</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1943-44</td>
<td>230</td>
<td>17</td>
<td>7.30</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1944-45</td>
<td>295</td>
<td>21</td>
<td>7.12</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>1945-46</td>
<td>348</td>
<td>20</td>
<td>5.75</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>1946-47</td>
<td>383</td>
<td>17</td>
<td>4.44</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1947-48</td>
<td>394</td>
<td>16</td>
<td>4.06</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>1948-49</td>
<td>367</td>
<td>6</td>
<td>1.63</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1949-50</td>
<td>362</td>
<td>18</td>
<td>4.97</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td>4,257</td>
<td>218</td>
<td>5.12</td>
<td>25</td>
<td>40</td>
</tr>
</tbody>
</table>

markedly. The majority of flocks revealed 0.5 per cent or less. Of the 151 flocks retested the same year, 125 obtained one or more negative tests. Over 50 per cent of the 218 “break” flocks obtained a negative rating the same year that infection was detected.
Table V gives the number of “breaks” which are classified according to the season and the number of years the flocks had been negative prior to the “break”. Among the 218 “breaks”, 100 flocks had been negative for only one or two years. Twenty flocks had been negative for 10 consecutive years. It is evident from these data that “breaks” may occur in flocks which have a long testing history without infection.

Relative to the explanation for the “breaks”, it is noted that in 117 cases the source of infection was unknown. Within recent years, with the exception of the last season, the cause of the majority of “breaks” could not be explained. In these cases little or no direct assistance could be given the flock owner to prevent a similar occurrence in the future. In many of these cases (74 flocks or 24.77 per cent), only one or two reactors were detected in the flock. Usually such “breaks” are not difficult to correct but nevertheless cause much concern to the flock owner in the operation of his business.

In conclusion it may be stated that the execution of a sound testing program cannot be successful without the fullest cooperation given by the flock owner, hatcheryman, or other agencies participating in a control and eradication program. An effective educational campaign which covers all phases of the disease is essential in the establishment and maintenance of pullorum clean flocks.

### Table V.
Pullorum “Breaks” by Seasons and Number of Years Negative Prior to Each “Break”

<table>
<thead>
<tr>
<th>SEASON</th>
<th>NUMBER OF &quot;BREAKS&quot;</th>
<th>NUMBER OF YEARS NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930-31</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>1931-32</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>1932-33</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1933-34</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>1934-35</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1935-36</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>1936-37</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1937-38</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1938-39</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>1939-40</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1940-41</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>1941-42</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1942-43</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>1943-44</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>1944-45</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>1945-46</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>1946-47</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>1947-48</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>1948-49</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>1949-50</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>218</td>
<td>62</td>
</tr>
</tbody>
</table>

last season, the cause of the majority of “breaks” could not be explained. In these cases little or no direct assistance could be given the flock owner to prevent a similar occurrence in the future. In many of these cases (74 flocks or 24.77 per cent), only one or two reactors were detected in the flock. Usually such “breaks” are not difficult to correct but nevertheless cause much concern to the flock owner in the operation of his business.

In conclusion it may be stated that the execution of a sound testing program cannot be successful without the fullest cooperation given by the flock owner, hatcheryman, or other agencies participating in a control and eradication program. An effective educational campaign which covers all phases of the disease is essential in the establishment and maintenance of pullorum clean flocks.
REFERENCES


REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY


Progress in research on transmissible disease of poultry has been marked by continued accomplishments since the last annual meeting of this Association. Outstanding among the accomplishments was that dealing with successful chemotherapy agents in the prevention and control of blackhead in turkeys. These agents should not be considered as something to supplement sound sanitation practices but as auxiliary aids in making turkey production less hazardous.

The California Department of Agriculture and the U. S. Bureau of Animal Industry jointly reported an outbreak of the highly fatal Asiatic Newcastle disease in a shipment of game birds from Hong Kong, China and its immediate eradication by prompt slaughter and disinfection of premises. This serves to emphasize the constant vigilance necessary to protect the poultry industry against the importation from foreign countries of either new forms or new entities of highly infectious diseases.

Your committee feels it timely to re-emphasize the basic soundness and economy of established sanitary and management procedures for preventing and controlling the spread of transmissible diseases. More education is mandatory to stress that the movement of infected or carrier poultry or their products and excreta from one place to another constitutes the major and most effective means whereby contagious diseases are perpetuated. All individuals and groups in the industry must recognize the responsibility involved and act towards bringing about organized voluntary effort where necessary and regulatory procedures to curb disease through preventing its spread. Resort to temporary expedients of emergency treatment with untried or unproved products has not and may not be expected to be effective or economical.

PULLORUM DISEASE

The National Poultry and Turkey Improvement Plan continues to show an increased progress in the control of pullorum disease. In Table I, furnished by Dr. Heemstra of this committee, it will be observed that in 1949 there were marked increases in the numbers of both chickens and turkeys tested and that the incidence of reactors in both instances show a reduction as compared to previous years.

Heemstra (1) reported co-operative studies on K and variant antigens. None of the findings pointed to a marked importance of the variant pullorum problem or to the desirability of the routine use of polyvalent antigens, on the other hand no factors were revealed that would tend to discourage their use. By use of the standard antigen alone an occasional variant infected bird may be missed. The probability is apparently no greater than missing a standard strain infected bird by a polyvalent antigen. Any type antigen will occasionally miss infected birds.
In testing turkeys Heemstra (1) reported the whole blood was decidedly inferior to the tube test in detecting carriers of pullorum disease inasmuch as better than half of the birds from which Salmonella pullorum was isolated failed to show any reaction on the whole-blood test. He emphasized the need of additional work towards the development of an effective rapid whole-blood test.

Workers found that streptomycin (2, 3) and sodium sulfadiazine may produce a bacteriostatic and bacteriologic action on Salmonella pullorum. Sulfamethazine and sulfaquinoxaline (4) (Grumbles et al.) were found to be effective in reducing mortality from pullorum disease in chicks under laboratory conditions. However, neither drug was effective in reducing the number of reactors to the whole blood agglutination test for pullorum disease.

Cloudy turkey serums can be rendered suitable for the agglutination test by extracting the high concentration of liquid material with ethylene dichloride.

**Table I**

*Chickens and Turkeys Officially Tested for Pullorum Disease, Number and Per cent of Reactors, 1945-1949*

<table>
<thead>
<tr>
<th>YEAR†</th>
<th>CHICKENS TESTED</th>
<th>REACTORS</th>
<th>TURKEYS TESTED</th>
<th>REACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Number</td>
<td>Per cent</td>
<td>Number</td>
</tr>
<tr>
<td>1945</td>
<td>27,003,930</td>
<td>495,644</td>
<td>1.84</td>
<td>2,794,978</td>
</tr>
<tr>
<td>1946</td>
<td>30,355,224</td>
<td>543,356</td>
<td>1.79</td>
<td>2,061,043</td>
</tr>
<tr>
<td>1947</td>
<td>30,093,726</td>
<td>354,255</td>
<td>1.18</td>
<td>1,265,037</td>
</tr>
<tr>
<td>1948</td>
<td>29,320,525</td>
<td>250,553</td>
<td>.86</td>
<td>1,990,073</td>
</tr>
<tr>
<td>1949</td>
<td>37,237,674</td>
<td>269,115</td>
<td>.72</td>
<td>2,340,676</td>
</tr>
</tbody>
</table>

* This Table furnished by Dr. Heemstra.
† All tests taken in the month of July.

Bacteriologic analysis of 500 eggs and 120 samples of dried eggs revealed 0.6 and 3.0 per cent, respectively, harbored salmonella, U. S. inspected and passed birds yielded these bacteria much less frequently than uninspected birds.

Wai and Stafseth (5, 6) studied pullorum disease in turkeys with respect to different blood components. A minimum standard technique for the bacteriological examination of pullorum reactors was proposed by Jungherr, Hall and Pomeroy (7).

**Fowl Typhoid**

Hall (8) and associates reported studies on attempts to control fowl typhoid by employing agglutination tests and sulfonamides.

Boney (9) mentioned the use of sulfaquinoxaline to reduce death losses in turkeys affected with fowl typhoid.

**Newcastle Disease**

Newcastle disease continues to receive ever increasing attention as evidenced by the addendum to the literature survey by Beaudette (10). Yates, Fry and Delaplane (unpublished data) observed Newcastle disease in 10 day old guinea chicks in which 18 out of a lot of 20 died. Symptoms were typically neurotropic in char-
acter, occasionally both nervous and respiratory symptoms were observed. It is believed that this constitutes the first isolation of virus from the naturally occurring disease in this bird.

**INFECTION BRONCHITIS**

Infectious bronchitis continues to be an important disease in New England and other Northeastern states, perhaps more so than Newcastle disease.

The exposure method of immunization is used extensively in the area. This method of immunization was discussed by Van Roekel, Levine, Jungherr, Delaplane, and Witter at the 22nd annual meeting of the Northeastern Conference of Laboratory workers in Pulmonary Disease in Burlington, Vermont, June 21–22.

Fabricant (11, 12, 13) reported on virus isolation and serum tests for the diagnosis of infectious bronchitis.

Loomis, Cunningham, Gray and Thorp (14) described the gross and microscopic pathologic alterations of chick embryos infected with infectious bronchitis. This work added invaluable information for the identification of this virus. Hofstad and Kenzy (15) were able to produce the disease in chick 4, 6, 7, and 10 days old hatched from eggs laid by bronchitis recovered hens, which observation indicated that the immunity thus conferred was not sufficient to protect against laboratory exposure.

**OTHER RESPIRATORY DISEASES**

In some areas laryngotracheitis has come into prominence after several years of low incidence.

It is difficult to evaluate properly the prevalence of the different respiratory infections due to lack of diagnostic facilities and surveys in the various states.

The chronic respiratory disease has been found to be of significance in New England where presumed failures of infectious bronchitis and Newcastle disease immunizations have occurred in individual flocks. The work of Delaplane (16) which suggested that the agents of the chronic respiratory disease and that causing infectious sinusitis of turkeys were identical shows the chronic disease to be national rather than local in distribution. In the chicken the clinical symptoms of infection are indistinguishable from the respiratory symptoms of Newcastle disease or infectious bronchitis except that the disease persists for months and spreads slowly. Research on these agents to learn more about methods of isolation etc. is much needed and necessary if proper progress in its control is to be achieved.

**Sinusitis of turkeys.** Virus-like agents have been isolated and reported by several workers. Reports on the use of streptomycin and aureomycin in treating affected turkeys indicate these products have value in hastening recovery from sinus involvement.

**Respiratory infection of quail.** A virus isolated by Olson from quail (on this program) stressed the importance of studies of these and other wild birds as possible sources in infection for poultry. This was also brought out by the work of Levine and Fabricant (17) who reported on a heretofore undescribed virus causing heavy losses in ducks on Long Island. The disease was characterized by a sudden onset and short course. The gross lesions were characterized by enlargement of the liver, with discoloration and punctate or ecchymotic hemorrhages. Quite often the kidneys
were swollen and their blood vessels injected. Attempts to control the disease by use of live and formalized vaccines of embryo origin gave no tangible results. The use of antisera from recovered ducks was quite effective in the control of the disease. This year there was produced sufficient antiserum to treat 2,000,000 to 3,000,000 ducklings. This is the first time that an antiserum has been used successfully in this country to control outbreaks of a virus disease in fowls.

\textit{Avian leukemia complex.} This group of conditions continues to take a heavy annual toll of chickens produced in the country. It probably out-ranks all other known diseases in loss to the industry. The research on this disease complex of necessity is of a fundamental nature. It will require continued and increased support of facilities at the U. S. Regional and at other laboratories if the workers are to be enabled to attack this problem. It is believed by many workers that the fowl paralysis form of leukemia is being observed more often at an earlier age than in the past.

\textit{Leucocytozoon infection.} Bierer reporting in the June 1950 "Turkey World" mentioned the effective use of sulfaquinoxaline in the treatment of birds affected with leucocytozoon infection. The occurrence of leucocytozoon and hemoproteus infections was reported in domestic ducks in northern Michigan by Chermin and Sudun (18).

\textit{Keratoconjunctivitis.} Keratoconjunctivitis is being observed more frequently in young growing chickens. Bullis and co-workers (19) believe it results from the concentration of ammonia vapors in the brooder houses.

Cole (20) reported on the familial incidence of blue comb disease.

\textit{Blackhead in turkeys.} Devolt and Holst (21) reported on blackhead therapy using chlorohydroxyquinoline and Vioform. Sautter and Pomeroy (22) reported on Stovarsal and Vioform. Jungherr and Winn (23) reported their results on the field use of enheptin T. Enheptin became commercially available this year. More information concerning the effectiveness of this compound under field conditions should be available in another year.

**BIBLIOGRAPHY**


THE POULTRY GRADING AND INSPECTION PROGRAM OF THE
UNITED STATES DEPARTMENT OF AGRICULTURE

W. D. TERMOLFEN

Director of the Poultry Branch, Production and Marketing Administration, United
States Department of Agriculture

Last July the chairman of the Committee on Meat and Milk Hygiene of your As-
association, Dean Bryan of Michigan State College, invited me to appear on your pro-
gram to discuss the poultry grading and inspection program of the U. S. Department
of Agriculture. This invitation was, I am certain, sent me through the request of
your good Secretary, Dr. R. A. Hendershott, who had told me earlier in the year he
felt a discussion of the revised poultry grading and inspection program which became
effective on January 1, 1950, would be of interest to the members of your Association.
Consequently, it is a pleasure to be present and it is to be hoped much of mutual
benefit and better understanding will result from the presentation of this paper and
the personal discussion which I may have with a number of you.

Since the beginning of the USDA's work in the grading and inspection of poultry
about a quarter of a century ago, there have been great changes in the importance
and make-up of the poultry industry and almost what might be considered a com-
plete revolution in the methods of processing and handling poultry meat. Twenty-five
years ago, practically all poultry meat came from the farms of this country as a
byproduct, so to speak, of egg production. The great bulk of these birds were from
small farm flocks raised largely under rather careless and makeshift methods. The
other important poultry meat, namely turkeys, also came principally from small
farm flocks.

Today the story is much different. Nearly half of our chicken meat comes now
from specialized meat producers' flocks and more than half the turkey meat is from
such flocks. The development of commercial and specialized poultry meat produc-
tion is a fascinating story, although too long to tell here even though it bears
significance to the subject under discussion. In passing, let me give you just one
bit of statistics. In the 5-year period 1935-39, the number of commercial broilers
produced in the United States averaged annually about 70 million. In 1949, this
had grown almost seven times to 487 million. It is the opinion of students of this
industry that the next few years will see a continued increase. In the same period
of time the poundage of turkeys slaughtered has more than doubled.

Modern production methods resulting from scientific research and their practical
application are bringing about greater efficiency and economy of production. This,
coupled with recognition of the value of eggs and poultry meat in the human diet
and improved marketing and merchandising techniques, indicates that in the years
ahead the poultry industry will be expanded still further. Processing and mer-
chandising methods have changed very materially. The old dry-picked poultry
method has passed out of existence. Mechanical gadgets of all kinds, such as semi-
scald tanks and automatic pickers, have replaced the old hand methods. The process-
ing and sale of ready-to-cook poultry are rapidly replacing the uneconomic,
unattractive and unappetizing dressed poultry. Self-service stores, where the housewife can find the products she wishes all packaged and ready for her use, are encouraging the trend toward ready-to-cook poultry. Many other progressive developments could be discussed but time will not permit.

All these developments and changes are important when one considers the administration, the planning, and the revision of programs such as the poultry grading and inspection program. We must keep up with these developments. We must modernize our programs and in so doing we must also attempt a little crystal gazing into the future. Always we must bear in mind that it is not good administration to change public service programs too often and for that reason when changes are made we must look ahead as to possible needs and requirements.

The poultry grading and inspection program, which is the topic for discussion, was developed after more than two years of study, conferences, meetings, discussions with individuals and group, and a great deal of correspondence.

Changes made in any program usually bring approval and acclaim from some and disapproval from others. As public servants, you know that you cannot please everyone all the time. There are some members of your Association who feel the program as a whole is most meritorious; there are others who have frankly told me they like parts of the program very much and are unfavorably inclined toward other parts. We have found some people who criticized the program because they did not understand it. Therefore, one reason why I am happy to be here today is because a discussion of the program is timely and because there is some misunderstanding as to the content of the program, its objectives and the manner in which it is being handled. Such misunderstanding can naturally be expected when a program is changed or is relatively new. Another reason is that even though our men, with the cooperation of representatives of the Solicitor's Office of the Department, take great care in writing regulations, these are sometimes not easy to grasp without many readings. Also, there are certain technical and operating procedures of handling the administration of the program which must be left to administrative directives. Another consideration is that for effective operation of a program, allowance must be made for gaining experience in the smooth application of certain methods and practices by administrative directives. I will have more to say about this later on.

In developing the revised poultry grading and inspection program there were certain fundamentals we believed should serve as a basis:

1. The changes in the industry which have already been mentioned and also the results of research must be kept in mind.

2. The program necessarily involved three basic activities, namely, minimum processing facilities and sanitary practices, grading for quality and inspection for wholesomeness. Who would be responsible for these three activities, of course, had to be discussed and considered.

3. The program so far as the federal government is concerned is a voluntary one. This fact I wish to emphasize because some persons have confused our inspection work with the requirement that red meats—beef, veal, pork and mutton—which move in interstate commerce must, by law, be federally inspected. We must clearly understand that this requirement does not apply to poultry in any form shipped interstate.
4. We develop our programs so they may be operated on a cooperative basis with official state agencies. At this time we have cooperative agreements with 47 states. Normally, these agreements are entered into with the State Department of Agriculture or Markets. It is our understanding that such state cooperating agencies will work out proper coordination and working relationships with other state regulatory agencies, such as livestock sanitary officials and public health officials.

5. Our programs are worked out and approved only after many conferences, group meetings and task group or committee meetings, with representatives of producers, processors, wholesalers, distributors, retailers, public eating places, consumers, home economists and educational and state officials. We try to work with various interested national and regional associations. Although we cannot always have every association represented on our task group committees, we do attempt to see that all such interested groups are on our mailing list. Our present mailing list contains the names of about 2,000 interested persons to whom copies of proposals are sent seeking opinion and suggestions. We feel this is a necessary supplement to the holding of committee and group meetings and conferences. This procedure indicates how far we go in seeking advice from representative and interested groups. We are not infallible and so perhaps we have missed some groups which should be represented at meetings or should be on our mailing list. However, whenever we learn of such a group we try to make up for the omission. After we have gone through all these procedures and before grading and inspection requirements and regulations become effective, they are published in the Federal Register. This gives anyone an opportunity to voice his objections to the regulations to the Secretary of Agriculture.

We realize, of course, that it is probably impossible to satisfy everyone and that there will always be some divergence of opinion to any program to which a majority agrees.

6. Programs must be as practicable, sensible and as economical as possible.

7. Programs can move ahead and must be adaptable as those in industry and official work are prepared and able to take additional steps and adopt new requirements.

8. In the development of a program the interests and the opinions of the producer, the processor, the distributor and the consumer must be considered.

These eight fundamentals served as a basis when the poultry grading and inspection program was modified and revised. We do not claim that this program as now written is perfect. Time, experience, changing conditions, attitudes of people and the development of new techniques and knowledge will certainly bring about improvement. We shall be alert to desirable changes and modifications. We shall not make changes too quickly or at too frequent intervals. As in the past, we shall vigorously and conscientiously work with as many interested groups as possible to make a still better program. We feel that once this voluntary program is properly understood, greater use will be made by the poultry trade of the opportunity to cooperate with the federal and state governments. We truly believe that through this program the consumer will have available a better product than previously has been available.

Now let's consider what is rather distinctly new in this program:
1. Minimum Sanitary Facilities and Procedures. In the past there were no minimum facility and sanitary operating requirements for the slaughtering and dressing of poultry as a prerequisite to grading and inspection. We did have such requirements for the eviscerating process as a part of the inspection program. Now, for both grading and inspection, we have requirements that plant operations must be carried on under prescribed minimum sanitary facilities and procedures. We believe, and I am certain you will agree, that this is a very desirable and progressive step. Certainly it will assure the consumer a far more wholesome product than has been available in the past. It fits right in with the steps and operating programs which many reliable and progressive poultry firms have taken in recent years.

2. Ready-to-cook Poultry. In the past, many different terms have been used in consumer sales to describe poultry which was presumed to be ready for cooking without further processing in the kitchen, such as eviscerated, drawn, cut-up and ready-for-the pan. It is felt the term “ready-to-cook” will be more easily understood and will have sales value. In the past, we have had programs covering two phases of this type of poultry. (1) Graded and inspected and (2) inspected. For the first of these, we have had licensed graders and licensed veterinary inspectors who handled grading for quality and inspection for wholesomeness. For the second, we had licensed veterinary inspectors who checked and passed the eviscerated carcass for wholesomeness while the company utilizing this service was entirely responsible for the quality of the bird. Thus, in the previous program, no one could put an official Government grade on the so-called eviscerated poultry without federal-veterinary inspection and this meant the actual inspection was done by a veterinarian. No use was made of lay inspectors. Many representatives of producer groups, poultry organizations, marketing firms and a considerable number of the state departments of agriculture and markets, felt this was definite discrimination. They pointed out that since, in the case of inspected poultry, we were willing to leave the entire responsibility for quality in the hands of the processor or marketing firm, why should we not, if we had a licensed grader in the plant, be willing to leave to the plant management either all or a major part of the responsibility of determining wholesomeness. They pointed out that according to our program for grading we require that the licensed grader carefully examine the carcass. They further pointed out that rejections for possible poultry diseased condition were exceedingly small for Grade A and B qualities of poultry and especially in the young stock which comes from the specialized meat producing flocks and they recommended that a consumer grade label should be put only on carcasses of Grade A and B quality.

Trade members and some state officials stated they had confidence that persons with sufficient knowledge would be provided on the eviscerating lines to check the viscera for indications of poultry disease. They also pointed out that today a great amount of poultry is sold by processing plants in dressed form and is drawn either by the butcher in the retail shop or by the purchaser in the home. Since this was universally practiced they asked how we could believe that the person they provided on the eviscerating line would not know more by far about indications of poultry disease than the average butcher or the millions of consumer purchasers. It was common knowledge that some dealers were buying federal and federal-state graded
and labeled dressed poultry which merely carried the grade and class and were eviscerating it and letting the label stay on. There was nothing we could do about this since we had no provision for grading uninspected ready-to-cook poultry. It was repeatedly pointed out to us that existing conditions tended to force drawing operations away from well-equipped processing plants, small as well as large, into retail stores and jobbing establishments.

We could not run away from or disregard these various comments and facts. We had a challenge which had to be met. We did not want to discard our existing program but we recognized that we must find a way to permit grading for quality of ready-to-cook poultry which was not inspected for wholesomeness by a trained veterinarian as we required. We believed that the inclusion of minimum facility and sanitary operating requirements and certain other requirements in the regulations, supplemented by administrative directives, would afford the consumer far more protection than they had been getting under the generally existing practices.

We have laid down the requirement that any plant or market agency participating in the ready-to-cook grading phase of the program must assume the major responsibility of seeing, in the eviscerating process, that carcasses which show evidence of disease or any condition which may render them unwholesome or unfit for food, are eliminated and therefore, that they are not included among the birds graded. Two sections of the regulations authorize the use of administrative directives and instructions. One, Section 70.13—"Prerequisites to grading and inspection," reads "Grading and Inspection of products shall be rendered pursuant to the regulations in this part and under such conditions and in accordance with such methods as may be prescribed or approved by the Administrator." In the other, Section 70.3, under the heading, "General—Grading and Inspection Programs and Services," is the following sentence in paragraph (i): "Poultry and domestic rabbits and edible products thereof shall be handled and kept in an official plant only under such conditions and in accordance with such methods as may be prescribed or approved by the Administrator."

On December 27, 1949, an instruction was issued to all regional inspection and grading supervisors on the subject, "Examination of Drawn Poultry Prior to Grading." This pointed out the plant's responsibility to assist the grader by providing a person or persons who have sufficient knowledge to determine the essential difference between diseased and healthy poultry. The plant must maintain a daily record of the number of poultry carcasses which have been rejected as unfit for grading and submit this report to the official plant grader at the close of each day's operation. Unfit, unwholesome birds which are rejected must be condemned and disposed of just as is done with "inspected ready-to-cook" poultry.

Previously, I mentioned the use of administrative directives and instructions. On May 9 the regulations were amended by the Administrator's Office to formalize the instruction of December 27 making it a prerequisite to the grading of ready-to-cook poultry that the plant provide a qualified employee to examine during evisceration each carcass for any condition which might render it unwholesome or unfit for food and to condemn and denature unfit carcasses. Further, water-tight receptacles, conspicuously marked with the word "condemned", have to be provided for handling such condemned carcasses. Daily records of unfit carcasses must be
kept and furnished daily to the official grader. Thus, the administrative instructions issued about 4½ months previously became a specific part of the regulations. On August 25, there was issued another memorandum of instruction to regional grading supervisors which required firms applying for approval for the graded ready-to-cook service to submit in writing a signed statement, giving specific and detailed information as to the qualifications, including experience and training of each person assigned to the examination of poultry during the evisceration process. Such statement is subject to the recommendation of the state and regional supervisors and final approval by the Washington office before grading service may be inaugurated.

Just recently another memorandum has been issued requiring that the statement of the plant employee’s qualifications be supplemented with a letter from a graduate veterinarian, attesting to the qualifications of such plant employees. In states which have set up state poultry inspection programs, such a letter may be prepared by the state veterinary supervisor in charge.

Some people and I certainly do not blame them, have been confused and do not understand that with respect to the question of wholesomeness the only difference between the graded ready-to-cook and the inspected ready-to-cook is that the inspector or inspectors at the eviscerating table are not Government-licensed veterinarians. We expect that our regional supervisors of grading and of inspection, accompanied by state supervisory personnel of cooperating state agencies, will make unannounced visits to official graded ready-to-cook plants and will check, not only on the work of the grader, but also of the plant employee who is inspecting the birds on the eviscerating line.

Thus, with the requirements we have put into effect and the evidence of the interest of the firms which are now operating under or expecting to apply for the service, we feel a very creditable handling of poultry in the graded ready-to-cook category will result and consumers can be assured of getting poultry which is very satisfactory both from quality and wholesomeness standpoints.

Mr. Henry G. F. Hamann, Chief of the Inspection and Grading Division, informed me that up to October 15, 1950 only 5 plants had been approved for the production of graded ready-to-cook poultry. Thus, it can be seen that great care is being taken in such approvals.

Our staff members are preparing a manual to serve as a guide for the lay inspectors as an aid in pointing out the abnormalities which indicate the existence of poultry disease conditions. Accompanying this will be a list of suggested federal and state bulletins for reference material.

At one step in developing this new program, we had considered incorporating a requirement that, for the graded ready-to-cook class of poultry, the examination of the viscera had to be done by a person approved or licensed by the state cooperating agency. A special subtask group of our standards and grades advisory committee was appointed to develop a proposal for the qualifications of lay-inspectors and a uniform system for state poultry inspection services. I thought this group developed a quite creditable suggestion. However, on checking with quite a number of officials from state cooperating agencies, we found too many who felt they could not take on such responsibility at the present time.

At our request, the chairman of this subtask group has broadened the member-
ship of his committee and has been giving further study to the proposal; also, to make practical demonstration of how such plan could be applied, we are seeking cooperation with several states. It now looks as though considerable experience will be acquired this year.

For the last few months the State of Virginia has been developing a program. In August, we had a conference with Dr. A. J. Sipos, State Veterinarian for the Virginia Department of Agriculture, who is probably known to most of you. A plan for training lay inspectors, licensing them, making them state employees, if possible and having Dr. Sipos and any necessary assistants supervise them, seemed the logical approach in that State. Perhaps there are still other approaches. We hope some of you who are here today will be able to cooperate with us. It seems logical to assume that if we can have one or more practical experiences as a basis, we can then demonstrate its feasibility to all states.

It certainly seems desirable to expend every effort toward working out a practical and not too expensive voluntary program for some type of official inspection of ready-to-cook poultry. The 250,000 retail stores estimated to be selling poultry to consumers would be, in my opinion, far better off if they handled poultry only in ready-to-cook form. Best figures available to us indicate that about 1,900 poultry processing plants exist which can handle a carload or more of poultry every week. Around 1,400 of these, at present, have facilities only for dressing. The remaining 500 plants are reported to have facilities for drawing or eviscerating and in this group 125 are said to have facilities for canning poultry.

On October 15, according to the Poultry Inspection Service, there were 145 plants, (including canning plants), that maintain federal veterinary inspectors. There are, of course, literally hundreds of small dealer units, some of which dress poultry and draw poultry. There are many others which buy dressed poultry and then further process it into drawn or cut-up form. It cannot be said that all these various methods of handling poultry should not continue. Their great number presents some very definite problems when trying to develop a program. I do not believe any of us would take the position that poultry should be handled and processed only in large elaborate plants. Also, it seems obvious that the change-over from dressed to ready-to-cook poultry will come about gradually. We must remember that each group involved in the production, processing and distribution of poultry meat, as well as the various groups of state and federal officials, all have a right to their opinions. When a new program is at first tried, some differences of opinion will exist. It is my personal hope that the day will come and I trust it is not too far distant, when a program so practical and sensible can be worked out to encourage participation of the poultry trade on a voluntary basis, so all poultry which moves through commerce will be prepared in ready-to-cook form and will be both graded for quality and inspected for wholesomeness.

A member of your Association, in correspondence with us, has expressed the opinion that all poultry should be inspected for diseased condition and that such inspection should be conducted only by a competent, well-trained civil servant (lay inspectors) who conducts these inspections under supervision of a competently trained veterinarian. With this suggestion I am in accord providing it can be done on a voluntary basis. The big problem facing us is how this can be done. Perhaps
the experience in Virginia will provide the answer. It seems to me that general acceptance by the poultry trade of such a program will come only when it is available in most states. Thus, this is not a problem which rests solely in the hands of the federal staff. We welcome the opportunity of working with state people. In the meantime, we do not feel we can deny companies that are making an earnest effort to meet reasonable food health standards the privilege of having graded the ready-to-cook poultry they produce. The challenge is before us and we hope you and other state officials will help us to meet it.

3. Official Labels is the third important change in the new program. Formerly the labels for both graded and inspected poultry products were in the form of a shield. Consumer groups are becoming better organized and are pressing for and insisting on distinctive, explanatory and easily identifiable and understandable labeling of the products they buy. Representatives of consumer groups had told us that the use of the shield-shaped label for both graded and inspected products was confusing. They pointed out that the inspection mark used on red meats was a circle and that consumers had become well acquainted with its meaning and significance. Thus, it seemed a reasonable and sensible move to change the inspection label from a shield to a circle carrying the inscription, "Inspected for Wholesomeness by U. S. Department of Agriculture." The official grade label will be continued in the form of a shield, upon which will be the U. S. Grade and the class of product it identifies. Where a plant is producing both officially government graded and inspected poultry, a label combining the shield and circle can be used.

These are the important changes from the program existing prior to 1950. Let me repeat, we do not claim the program is perfect. Since it is and shall continue to be our policy to develop and carry out our program in close cooperation with official state agencies, we earnestly solicit suggestions and criticisms. We urge state agencies to develop and assume responsibilities in connection with the program. We hope that a practical, satisfactory and acceptable voluntary program may be developed making possible the use of lay inspectors qualified, licensed and supervised by a qualified, competent and trained veterinarian. Your Association, cooperating with state agricultural and marketing officials, is the most logical group to assist in developing such a program. We will be happy to work with you. It is only through such cooperation that we all, as public servants, can render good, sound, and worthwhile service to producers, handlers and consumers.

In an effort to clear the air so to speak and with the hope of getting unanimity of opinion between industry and various governmental agencies toward a more acceptable program, I would like, in closing, to mention the following. We have participated in a meeting between a small group of industry representatives and state and municipal public health and livestock sanitary officials. At that meeting in Trenton, New Jersey, in September, an agreement was reached that another meeting would be held between industry and state and municipal representatives and we agreed to be present. In late September a subtask group of the Industry Advisory Committee which works with the Poultry Branch met in Washington and studied the problem and made certain suggestions. The Poultry Branch has issued an invitation for representatives of industry trade associations and organizations and agencies of municipal, state and federal employees interested in poultry
grading and inspection to attend a meeting in Washington, D. C., on November 29 and 30 to discuss this whole question and especially a method of utilizing lay inspectors under veterinary supervision. Your organization is among the groups invited to have two representatives present.

It has been a pleasure to be with you, and may this day be the beginning of many years of harmonious and pleasant working relationships between us.
OBJECTIONS OF PUBLIC HEALTH AUTHORITIES WITH RESPECT TO THE RELAXING OF THE FEDERAL POULTRY GRADING AND INSPECTION REGULATIONS

OSCAR SUSSMAN, D.V.M., M.P.H.

Senior Public Health Veterinarian, Division of Environmental Sanitation, State Department of Health, Trenton, New Jersey

Gentlemen, it is a pleasure to have been asked here today to present the position of organized public health with respect to the relaxing of the Federal Poultry Grading and Inspection Regulations on January 1, 1950.

First of all I should like to take you back to September 27, 1948—over two years ago—and in this very city. I quote a letter from the Director of Public Health of Arizona to the Secretary, U.S. Department of Agriculture.

"Phoenix, Arizona
September 27, 1948

Honorable Charles F. Brannan
Secretary of Agriculture
Washington, D.C.

"Honorable Sir:

"This is to inform you that the Arizona State Board of Health in session Sunday, September 26, 1948, instructed me to forward a strong protest against your contemplated action to permit the federal grading of drawn, uninspected poultry. The Board had previously been informed that such action was being contemplated by your office.

"They are of the opinion that the stamping of such poultry as 'Graded' by the United States Department of Agriculture would tend to deceive the consuming public into believing such grading connotes the safety factor of previously inspected carcasses. Through the years the United States Department of Agriculture seal on both poultry and meat has served as a guide to the consuming public for those products, the safety and purity of which is unquestioned. This action would seriously undermine public confidence were they aware of the implications and would just as seriously deceive them if they were not made aware.

Respectfully,
J. P. Ward, M.D. M.P.H.
Director of Public Health
For the Arizona State Board of Health"

The State of Arizona was not alone in this feeling as indicated by a resolution of the organization in health circles quite closely resembling our group. I refer to

1 United States Department of Agriculture, Production and Marketing Administration, Poultry Branch; regulations governing the grading and inspection of poultry and domestic rabbits and edible products thereof and United States specifications for classes, standards, and grades with respect thereto. Reprinted from the Federal Register, November 15, 1949, Washington 25, D. C., effective January 1, 1950, as corrected to May 11, 1950.
the State and Territorial Health Officers Conference. All 48 state health officers are members of this group and agreed to the following resolution which was sent to the Secretary of Agriculture, Honorable Charles F. Brannan on November 17, 1948. I quote:

"WHEREAS, the U. S. Department of Agriculture has provided an ante-mortem and post-mortem poultry inspection service to any poultry processor for the past 20 years; and

"WHEREAS, the USDA was also providing a grading service which classifies un-drawn carcasses as to the amount of flesh, fat and finish into grades; and

"WHEREAS, certain groups in the poultry industry were recently requested by the USDA to consider a proposal to federally grade uninspected drawn poultry; and

"WHEREAS, the favorable consideration of such a proposal for grading uninspected eviscerated poultry would be a serious public health hazard since such grading of drawn poultry would falsely imply to the consumer that the product was sound, wholesome, and fit for food where it is conceivable that such a product officially graded by the USDA might be diseased and unfit,

"THEREFORE BE IT RESOLVED, that the Association of State and Territorial Health Officers express its disapproval of such a proposal which, if adopted, would practically eliminate the poultry inspection service and with it the protection of the public against the marketing and consumption of diseased and unfit poultry products."

OBJECTIONS IGNORED

Thus the new regulations of the USDA poultry branch were promulgated as of January 1, 1950, in spite of the known objections of the organization representing all state health authorities, numerous other national and state groups, including admonitions from at least three other members of the official federal family, namely the Army, which will not buy uninspected eviscerated birds, Federal Food and Drug Administration who feel the regulations may mislead the consumer, and the United States Public Health Service which has just recently restated its position to us in New Jersey. Yet the USDA has repeatedly maintained that the new regulations were worked out with the approval of the majority of the groups concerned.

PROGRAM ANALYZED

Let us turn to the new regulations themselves. The United States Department of Agriculture Administrators, in these regulations as amended to May 11, 1950, have recognized the failings and weakness of the original draft with respect to guaranteeing wholesomeness by virtue of the grading procedure. This recognition and a half-hearted attempt to overcome the objections of health officials have resulted in a compounding of the original errors to a point of utter confusion. For example, according to the definitions as set up in the regulations a "grader" is a person authorized to certify as to class, quality and condition of a bird; an "inspector" is a person authorized to certify as to condition and wholesomeness; by definition, therefore, a grader cannot inspect for wholesomeness. Thus far I believe you and I as health and sanitary officials, have a clear understanding of what is meant. I should like to
quote Section, 70.104 (2), which applies to the specifications for grading of ready-to-cook (eviscerated) poultry:

"Carcasses affected by, or showing evidence of, disease or any condition which may render them unwholesome or unfit for food are not included in any of the quality designations specified in this section."

If, as this section so clearly states, diseased carcasses are not included, it is quite logical to assume, therefore, that they are excluded. This process of exclusion indicates the need for someone qualified to know a diseased from a healthy bird. The point is, who is so qualified? An inspector? An examiner? A grader or a company eviscerator? The Department of Agriculture is not very helpful in answering this question for on May 11, 1950 the Federal Register read as follows:

"In order to effectuate the purpose of the aforesaid regulations and to maximize the benefits of the grading service thereunder, the prerequisites hereinafter set forth are deemed necessary to assist the grader (who examines the carcass of any ready-to-cook poultry or ready-to-cook domestic rabbit to ascertain its quality and condition) in determining whether any such carcass is unwholesome or otherwise unfit for human food. Without this assistance to the grader, it would be difficult, at times, to determine whether the carcass is unfit for food since the viscera which was removed prior to the time of offering the carcass to the grader may have contained the only visible evidence of unwholesomeness. This responsibility, which is in the nature of a reasonable safeguard, should be assumed by each official plant in which the grading service is performed. The requirements regarding the disposition by the plant of all condemned products are similarly important and necessary."

Thus, in a sweep of the hand, our grader, who can tell a plump, fat, whole skinned, whole boned bird from a thin, scrawny, emaciated, torn skin, broken boned bird, becomes the mentor and instructor of a "company paid eviscerator" just turned "inspector". It is discouraging to realize that a federal administrative agency can be so confused. Here in the regulations we have a grader who is authorized and qualified to ascertain only, but who is going to be assisted in doing a job of inspection for wholesomeness which he is not authorized or qualified to do.

Section 70.302 of the new regulations provides for a company paid employee to examine for wholesomeness. In trying to find out what is meant by "examine" I noted in five different dictionaries that the primary synonym of "to examine" is—"to inspect". I, therefore, concluded that the company paid examiner is actually a company paid inspector. In this case Section 70.4 (f) applies and I quote:

"Financial Interest of Inspectors. No inspector shall inspect any product in which he is financially interested."

I suppose it will be argued that a company paid eviscerator, examiner, or inspector being paid directly by a packer and subject to promotion or dismissal by his employer, does not mean he has a financial interest. However, all health and law officials contacted on this point felt that direct control and payment of the inspector by packer implies financial interest.

VOLUNTARY NATURE OF PROGRAM

At many meetings explaining the new U. S. Department of Agriculture's regulations, health authorities have consistently been charged with being confused in
regard to the voluntary or compulsory nature of the poultry grading and inspection service. Health Authorities are not confused. They feel that attempts by the U. S. Department of Agriculture to justify the regulations on the basis of the voluntary nature of the program are unwarranted. The following points may be of interest:

1. A program that is voluntary does not mean voluntary loss of consumer reliance upon “shielded” products, particularly after years of advertising and careful adherence to inspection regulations. One nationally famous processor said, “We have maintained poultry inspection in our plants for many years at considerable expense and we do not wish the prestige of the shield symbol so obtained to be wantonely lost by its use on some less safe class of product.” Thus, there was nothing voluntary in the shield switch as far as at least one packer is concerned.

2. Hundreds of consumers of eviscerated poultry products were questioned as to which they would purchase and why, given a choice of birds labeled “Grade A” or “Inspected for Wholesomeness”. Ninety-five out of a hundred answered “Grade A”. When asked, “Does Grade A mean it is safe?”, the answer invariably was: “this ‘Shield’ means it is safe, it has been inspected for wholesomeness or the United States Department of Agriculture would not allow them to use it on the box.” Would this be considered a voluntary wish on the part of the consumer, to be deceived into believing the product was properly inspected by someone qualified to do so, or would it be compulsory since she cannot go behind the scenes as we are doing today. For your further information I should like to repeat the words of one consumer representative who was taken behind the scenes to hear the United States Department of Agriculture’s side of the story as well as that of health officials. She was asked to keep her peace until an organized attempt could be made to review and revise these “Confusing Regulations”. She said: “Housewives of to-day are not fooled for very long, so the new grading shield that eliminates inspection for wholesomeness is certain to arouse widespread consumer reaction. The American Housewives Organized has never opposed grading for quality of any product. However, quality grading that may discount a diseased condition under the new federal regulations appears as a serious threat to public health.”

3. A “voluntary” grading program does not mean a “voluntary” overthrow and elimination of all state food and drug laws and nullification of the federal Food, Drug and Cosmetic Act with respect to mislabeling. Under the regulations as written, the United States Department of Agriculture guarantees to the purchaser of a “Grade A” “ready-to-cook” bird that—“Carcasses affected by, or showing evidence of, disease or any condition which may render them unwholesome or unfit for food will not be graded”. Since no adequate inspection is provided to so eliminate the diseased bird it is, therefore, a “Misbranded Product” under many of the state food and drug laws and may even be so considered under the Federal Food, Drug and Cosmetic regulations.

4. “Voluntary” does not mean that it is “compulsory” for the United States Department of Agriculture to provide the poultry industry with a federal insignia which will mislead “Mrs. Consumer”. Interestingly enough, while the U. S. Department of Agriculture is willing to mislead “Mrs. Consumer” with regard to poultry, they are not willing to do so with regard to dog food. Regulations governing the
use of the U. S. Department of Agriculture shield on “Dog Food”, also provided for under a “Voluntary” program, require a “Compulsory” inspection for wholesomeness.

ECONOMIC FACTORS

In addition to being accused of not understanding the voluntary nature of the program, health authorities have also been accused of not realizing the economic factors involved. This point is untrue. Health Officials are constantly faced with decisions as to money vs. public health importance. Good meat inspection (red meats) helped to lift our packing industry out of the depths of consumer resistance at the time of the exposé by Upton Sinclair in “The Jungle”. Since that time many consumers will buy no red meats other than those federally inspected. The federal meat inspection regulations have not been a hindrance to interstate movement of meats, but rather they have resulted in a freer flow of commerce. At the outset of the poultry inspection program of the U. S. Department of Agriculture, a somewhat similar situation prevailed. Some packers wanted to have an official symbol on their canned chicken products as well as the eviscerated (ready-to-cook) product. They wanted a set of strict rules to follow so that they could assure their consumers of a safe, well prepared properly inspected product. Mind you now—this they obtained at an average figure of less than one cent per bird or approximately, $\frac{1}{10}$ of a cent per pound including inspectors’ salaries and overhead. Certainly, knowing the cost of inspection, no consumer would agree to dispense with such a “satisfactory efficient service.” Accusations of failing to take economics into account is a poor way of saying one cent per bird is too much to assure “Mrs. Consumer” of a safe wholesome product. Under the new grading program, unless sanitary principles will not be as strictly adhered to, unless unfit birds are not thrown out to the same extent, there can be no essential cost differences when compared to the well proved inspection program other than the difference between the inspectors’ salaries and the payment of the employee who now does the inspection. Assuredly a grader could not accomplish both grading and inspection tasks alone and would, therefore, need an assistant. The economics of this point is quite elementary—you get only what you pay for.

Often overlooked as a vital factor in any inspection program is the value to the industry of the post-mortem inspector who aids in determining faulty poultry hygiene and management at the farm. An inspector who knows diseases not as mere spots on livers but as a definite disease entity can and has saved producer groups much by providing the first essential of a disease control program and that is “What is the Disease?.” Uninformed, lay inspectors or examiners with no desire or background for the entire picture, can be expected to do no more than say “spotted liver” and condemn the carcass. Even then that might be difficult were the inspector company paid.

HEALTH AND CONSUMER ASPECTS

Finally let us view the new regulations from the health and consumer angle:

1. The increased sanitary requirements at the slaughtering and rough dressing
plants could have been instituted without changing any other portions of the regulations. The United States Department of Agriculture would have received nothing but applause from health authorities. As a health official I salute the administrators on this point—it is late in coming but I know from some of our own problems how late some essential points can be in getting processed into law.

2. To preclude the misuse of the federal grade label, health and consumer groups suggest the following “non-confusable” shield legends, namely:
   a. Inspected for Wholesomeness but not Graded for Quality.
   b. Inspected for Wholesomeness and Graded for Quality.
   c. Graded for Quality but not Inspected for Wholesomeness.

Certainly such terms are clear—distinct and information-producing if that is the desire of the industry and the United States Department of Agriculture. I might add there is room on the insignia for such labeling.

3. According to the United States Department of Agriculture there was definite discrimination in the old regulations which prevented the grading of uninspected “Ready-to-Cook” poultry. Health and informed consumer groups feel that if this was discrimination, then it was one of the instances in which it was justified. The main reason for keeping the grade label off uninspected “ready-to-cook” poultry is that the visceral evidence of disease is discarded prior to grading. The other reason is that a consumer buying a bird without viscera assumes if it has a federal grade label on it that it has been properly inspected and note I use the term “properly”. Generally a bird marked “Grade A” on quality characteristics, but actually “Grade B” can be so identified by regrading at any time. A Grade A bird with diseased intestines and infected lungs, however, cannot be identified as diseased—once it has been cleaned and eviscerated. It is generally agreed that it is an undue delegation of responsibility on the part of the U. S. Department of Agriculture to pass federal inspection procedures to a packer—legally a load packers should not be too happy to bear.

4. Reference is made to a release by the U. S. Department of Agriculture in which the Chief of the Poultry Branch, Mr. W. D. Termohlen states “Some people, and I certainly do not blame them, have been confused and do not understand that with respect to the question of wholesomeness the only difference between the graded ready-to-cook and the inspected ready-to-cook is that the inspector or inspectors at the eviscerating table are not government licensed veterinarians”. The U. S. Department of Agriculture implies, grading of poultry is of an equal calibre to inspection. Health officials, however, cannot agree when they realize the following:
   a. Graders educational requirements are as yet not definitely outlined.
   b. Graders qualifications to inspect for wholesomeness are not set down.
   c. No set procedure for evaluating the graders’ knowledge of pathology is set up, although the program is already in operation, and yet determination between health and disease is still a pathological determination.
   d. Graders are not authorized to inspect but according to section 70.302 they will be assisted to do so by a company paid examiner. This person who, if he is going to examine or inspect, will, in effect, be acting in contradiction to Section 70.4 (f) which refers to financial interests and previously mentioned.
RECOMMENDATIONS

What should we do about it?—I suggest we sit down around a conference table and provide industry and the consumer with an honest, workable, economical and efficient plan to achieve uniformity of grading and inspection. A spade must be called a spade, an inspection an inspection and not an examination. And I believe there is a place in the inspection program for the use of lay inspectors provided they are qualified, properly supervised, and government employed. If there is a need for the inspection of interstate red meats, there is also a need for the interstate inspection of poultry meats. A federal law should be worked out to provide for the compulsory inspection of all slaughtered poultry entering interstate commerce. This law should restrict the sale of all but “ready-to-cook” and live poultry in interstate commerce. Pending such congressional action, I respectfully suggest those provisions of the new poultry program, which allow the grade labeling of uninspected “ready-to-cook” poultry, be changed to eliminate the confusion that now exists as to the type of inspection for wholesomeness provided. If such products are not properly inspected for wholesomeness, I suggest the U. S. Department of Agriculture truthfully so state on the grade label. If graded “ready-to-cook” poultry are to be properly examined or inspected by someone qualified and legally authorized, I suggest the necessary adjustments in regulations be made. I further suggest that health and food and drug officials be called upon to work out those provisions involving basic health concepts and that grading officials be called upon to work out grading concepts.

Gentlemen, I think by this time you have the background for a decision on this problem, and therefore, I rest my case.
DISCUSSION OF POULTRY PAPERS

CHAIRMAN MOLLIN: Thank you very much.

You have just heard two very interesting papers on a very timely subject. I imagine it will start the ball rolling to work out a satisfactory solution to the problems involved.

I know from my own experience in the beef cattle business that there is a lot of confusion among consumers as to grading and inspection. I know many consumers see the purple BAI inspection stamp on a carcass of beef and think that insures the quality of the beef, when it insures only the wholesomeness. It possibly works the other way with beef also, although I don’t think quite so much.

One thing I am sure of is that there should not be the same type of symbol used to designate both quality and wholesomeness. I think part of the program is to educate the consumer. We haven’t gone far enough in educating the consumer on the standards of meat and poultry with regard to wholesomeness and quality. I think we have a responsibility there that we ought to try to meet. I wish we had time for some general discussion of this subject, Dr. Hendershott, but I am afraid we are too far behind time.

SECRETARY HENDERSHOTT: If there is no committee report on this matter, we might utilize that time for it.

CHAIRMAN MOLLIN: We referred Dr. Termohlen’s paper to the Executive Committee for further discussion. Does anyone have a pertinent remark to regarding these papers?

DR. D. M. CAMPBELL (Chicago): A good deal could be said, but time is short. I would like to correct two statements in the paper by Dr. Termohlen, in which I am sure the audience must have obtained a wrong impression.

It was stated that the only difference in the inspection now is that it is not made by a licensed veterinarian. Another difference is that the former inspection was made by a licensed veterinarian employed and paid and subject to discharge and promotion by the government.

The present inspection is to be made by a layman of so far uncertified training, employed, paid, and subject to discharge or promotion by the plant. That, it seems to me, is an essential difference.

It was implied that a hearing was held of all interested persons. One of those hearings was held in Chicago. It was public in the sense that the doors weren’t locked. It was as near secret in every other way as a hearing could well be.

I believe veterinarians should be interested in this subject. There were three veterinary publications in Chicago. Although they received a constant stream of releases and announcements from the U.S.D.A., they received nothing about that conference. There are metropolitan newspapers there, and this should interest the consumers. If the newspapers had known of the meeting they would have had reporters there, they didn’t.

There were livestock sanitary officials in that district, and in Michigan, Indiana, Illinois and Iowa, and not one of them was represented nor knew of the meeting, as far as I know.
DISCUSSION OF POULTRY PAPERS

There are many organizations that would have been interested, such as women's organizations. They had no representative there. I heard of the meeting 2,000 miles away. I got to Chicago at noon on the day of the conference, and I attended the afternoon session. There were perhaps fifteen or twenty processors there but, although I am somewhat acquainted in the poultry processing industry, I didn't know any of them.

There were five veterinarians present. One of them was an employee of the poultry industry; two of them were employees of the U. S. Public Health Department. A supervisor of inspection at one of the markets was there, and I was there making the fifth veterinarian and I can assure not by invitation.

The two public health officials went over pretty much the objections you have heard from Dr. Sussman. The supervisor of inspection sat there like a zombie. When it was over I asked him, "What's the matter? Are you a zombie?" He said, "I was told to be here to answer questions if I were asked, and to keep my mouth shut otherwise," or words to that effect.

I spoke a bit on the subject and it was answered with: "He seems to be representing the consumers." It seems the consumers were not supposed to be represented.

The addresses of the public health men were not considered or referred to by the presiding officer or by anyone else in the room. The entire talk was, "Will this help us sell it?"

To my mind this is an attempt to use the good will and the confidence that has been built in the meat inspection stamp over a period of fifty years to give some poultry processors—not the big ones in good plants—a free ride. It is a prostitution of the little purple stamp to the status of a sales slogan without regard to its effect on consumers. It has been opposed by every health service that has taken any action in the matter at all.

It is going too far when a governmental agency will reject the advice and the protest of the U. S. Public Health Service and that of the Public Health Service in every state, and many of the municipal public health services, and go right ahead with something to help sell a poultry product that nobody knows whether it is ready to cook or not, because "ready to cook" implies "fit to eat", that is unknown when this label goes on it. (Applause)

DR. TERMOLLEN: I would like to make just one comment, sir. I appreciate Dr. Campbell certainly has a right to make his statement. I could get up here and tell him about some letters that went into that particular area about the meeting. One comment he makes I think is not quite a fair comment, and that was when he said that this little round inspection thing—I want to point out that on the inspection program, which we have maintained, we still do that inspection only by veterinarians, and you cannot put that circle that says it is inspected, unless the man is our own employed veterinarian. Out of fairness that should be made clear, at least.

CHAIRMAN MOLLIN: The trouble is that consumers do not understand enough about it to be sure just what they are getting, and I think it is quite right that we should bring this out to the public.

DR. TERMOLLEN: That is correct, and we are anxious to do that ourselves.

DR. SUSSMAN: Just one comment, Mr. Chairman. With respect to the shield, you
have to support Dr. Termohlen on the stand that the shield change does bring inspection for wholesomeness in the round shield, but you must remember that on a ready to cook eviscerated bird never, before January 1, 1950, did any consumer in the United States take home a frozen eviscerated packaged bird with anything on it that said "U.S.D.A." It never said anything.

Never did the consumer take home a bird that did not have this policeman-type shield on it, which now, under the new regulations, she may take home in the same box. If you look at the news releases that have come out, they specifically state, "Graded", and they mention all the words about grading; but never once do they say, "Graded but Not Inspected for Wholesomeness," whereas I have a series of releases in which they have stated, "Inspected for Wholesomeness but Not Graded for Quality."

They tell the consumer that a product has been inspected for wholesomeness, but not graded for quality, but they will not tell the consumer it is graded but not inspected for wholesomeness. That may be a slip somewhere in the publicity department, but it has been called to the attention of those people, and there has never been a release sent out to tell the consumer the difference between those two products. We feel that the consumer should be informed.

In fairness to Dr. Termohlen I will say that now that the groups have become organized, there is a definite attempt on the part of the Department of Agriculture to listen to those Associations wishing to be heard. It is up to this Association to decide which way they want to be heard, or whether they wish to be heard. You have to make up your mind which way you are going.

SECRETARY HENDERSHOTT: I would like to speak on this just to clarify the position of our own Association and the activity of your Secretary with regard to this problem.

Mr. Termohlen knows this is a fact, because I have told him before, and I will tell you so that you may know where we stand on the matter.

Some three or four years ago I had warning that such a program was being contemplated. At that time we were meeting in the Hollanden Hotel in Cleveland, Ohio, with the International Baby Chick Association, and I had dinner with Dewey Termohlen, and brought up the subject.

At that time he gave me assurance that nothing such as this was contemplated. I told him at that time, "Dewey, we are alarmed about it, and asked him if such a move is contemplated at any time, will you let me know so that we in our Association may have an opportunity to be heard on it?"

We were not notified about it. These meetings were held. I never received any notification of them, nor any invitation to sit in on any meeting.

We have quarreled about the thing considerably in our State because we are vitally concerned on the eastern seaboard with this particular problem. I do now have Dewey Termohlen's assurance that we are going to start over—is that it, Dewey?—and have these group meetings, and that we in this Association are being invited to appoint one or two of our members to represent us at these group conferences so that we might be apprised of just what activity is going on and what is proposed and have an opportunity to help formulate the program.

I do think it is a good idea to have it aired in the Association. I think definitely
it is a part of our business. I can't understand how they would consider anything in a sanitary way without giving cognizance to an Association that has stood for livestock sanitation for over half a century.

I am sure they feel a mistake was made, and they are willing to correct it. I am quite certain that if we meet around a table and discuss this thing and have good representation from those groups that should be interested in the problem, we can work out a very serviceable program so that eviscerated, inspected poultry can be labeled for what it is and can move in interstate commerce.
The cases of Q-fever in stockmen and packing house workers reported during the past several years in Australia, Texas and Illinois strongly indicate that domestic animals were the source of human infection. The exact contacts are not yet known; future work must clarify this situation. In the meantime, good sanitation must be practiced in slaughterhouses and all persons in possible contact with infected animals must practice sound personal hygiene. Infection in cattle has been demonstrated serologically, using a complement fixation technique and specific Q-fever antigen. More recently Dr. Huebner and associates at Hondo, California reported the recovery of the infecting agent from the raw milk of forty of sixty-three dairies checked in Los Angeles County. The pooled raw milk from these dairies contained sufficient Cozella burneti (Rickettsia burneti) to readily infect guinea pigs on intraperitoneal or subcutaneous injection. Studies reveal that proper pasteurization by both the "high temperature short time" and "holding" pasteurization methods will destroy the infective agent. Research workers are busy on these problems and we hope that their results will clarify the picture in the future. Specific control measures must wait for these results.

The Production and Marketing Administration of the U. S. Department of Agriculture, on January 1, 1950, instituted a poultry grading plan that provides for certain lay plant employees to examine ready-to-cook poultry and rabbits during the evisceration process. This examination is for grading purposes only and is separate and apart from the "inspected for wholesomeness" conducted under the supervision of federal veterinarians. According to the Production and Marketing Administration, no carcass showing evidence of disease during evisceration will be presented for grade labeling; the insinuation being that the lay inspector, hired by the company, can differentiate between health and disease. This is open to some question. The new plan does provide for minimum sanitary standards in the eviscerating and the dressing rooms of the establishment; previously these standards applied only to the eviscerating room. The Production and Marketing Administration is commended for this desirable change.

The Committee recognizes the necessity of adequate inspection of meat and meat products, including poultry, at a cost that is not prohibitive to the consumer. Since the difference between inspection for quality and inspection for wholesomeness is an important problem, the Committee on Meat and Milk Hygiene of the Association has arranged for a thorough discussion of the plan at this meeting. It is hoped that certain changes may be made in the plan to insure ready-to-cook poultry of high quality that is wholesome for the consumer.

The Committee on Meat and Milk Hygiene of the U. S. Livestock Sanitary Association presents the following resolution for consideration by the Association:

208
"WHEREAS, the U. S. Department of Agriculture, Poultry Marketing Administration regulations with respect to poultry grading and inspection do at the present time have a number of confusing and contradictory points included, and

"WHEREAS, 'ready-to-cook' poultry that has been graded but not governmentally inspected might lead consumers to purchase a nice appearing but diseased bird, and

"WHEREAS, the U. S. Livestock Sanitary Association is fully cognizant of the implications with regard to ineffectual poultry disease control efforts upon the use of unqualified, poorly supervised inspectors, and

"WHEREAS, this Association desires to take cognizance and commend the activities of the Poultry Inspection Service, which has long provided the poultry industry and consumers with an efficient, economic and adequate plan of poultry meat inspection for wholesomeness; now, therefore, be it

"Resolved: That the U. S. Livestock Sanitary Association, in convention assembled at Phoenix, Arizona, this 2nd day of November, 1950, urgently requests the Poultry Marketing Administration of the U. S. Department of Agriculture to prohibit the grade labeling of 'ready-to-cook' poultry unless such poultry has been inspected by qualified, properly trained, properly supervised inspectors who are civil servants and, therefore, responsible primarily to the consumer."
Before discussing the recent developments in the activities of the World Health Organization (WHO) as regards rabies and its control, it is pertinent to review briefly the structure of this organization and the steps that led to the adoption of a rabies project.

As you know, the World Health Organization is one of several specialized agencies affiliated with the United Nations. The work of the organization is performed by three administrative bodies, that is, 1) the World Health Assembly, consisting of delegates from each member state; 2) the Executive Board of 18 members; and, 3) the Secretariat. The Assembly determines organizational policy, the Executive Board functions to give effect to decisions and policies of the Assembly, and the Secretariat, headed by the Director General, is the operating agency. The technical and administrative staff of the Secretariat has its permanent headquarters in the Palace of Nations in Geneva, Switzerland. There are also regional organizations, for example, the Pan American Sanitary Bureau, which supervises the activities of the World Health Organization in the Americas. Certain Expert Committees have been established by the Assembly and members of such committees are appointed by the Director General and act as consultants in their respective fields.

The problem of rabies was considered by the First World Health Assembly at its meeting in 1948, and the Executive Board at its second session instructed the Secretariat to submit a questionnaire to experts on rabies to determine recent developments in the study of this disease and the best methods for its control. The Second World Health Assembly recommended that an Expert Committee be convened in 1950 to consider the replies to the questionnaire and to plan research in which anti-rabies institutes would be invited to participate. In addition, the Executive Board authorized the Expert Committee on Rabies to undertake field trials, sponsored by the World Health Organization, of the hyperimmune serum-vaccine treatment for human beings bitten by rabid animals and the avianized rabies virus vaccine for immunization of dogs as a means of control and eradication of rabies.

The Expert Committee on Rabies held its first session in Geneva from April 17-22, 1950, and the report of this committee will be printed in the Technical Report Series of the World Health Organization and should be available soon through the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, New York. I wish now to review for you portions of this report. Let us first consider the recent advances in the study of rabies which form the basis for


2 Member, Expert Committee on Rabies, World Health Organization (WHO).
some of the recommendations for the control of the disease. The development of quantitative mouse tests for studying the antigenicity of vaccine virus strains and the immunizing or protective value of rabies vaccine was regarded as one of the most important developments of recent years, in that it led to very great improvement in the quality of vaccines produced by different institutes and commercial firms and served as a tool for the development of a new and very effective vaccine, the ultraviolet light irradiated vaccine, more commonly called "U.V." vaccine. The use of the mouse as an experimental animal also made it possible to apply the biological test for the presence of rabies virus in animals on a much larger scale than before. The development of an avianized rabies virus vaccine for immunization of dogs was recognized as another discovery of great value and promise for the control and eradication of rabies propagated among domestic dogs. From the experimental data available, it was concluded that the hyperimmune antirabies serum when combined with the use of vaccine offers a promising method for obtaining more certain protection of persons exposed to infection with rabies. The recognition of important vectors of rabies virus, other than dogs, cats, wolves, jackals, coyotes and foxes, for example, the Viverridae (mongoose, meerkat and genet cat) in the Union of South Africa, and vampire bats in South and Central American states, is a recent finding of marked importance when one considers the problem of eliminating the disease. The Expert Committee suggested the need for further ecological studies because of the demonstration of the existence of asymptomatic carriers among vampire bats. This indicates that other nocturnal small mammals may also serve as a reservoir for rabies virus in certain foci, which in turn form the nucleus for migratory epizootics of the disease. Another development is the discovery of a method of testing for the paralysis-producing properties of brain tissue, from which material, when infected with virus, antirabies vaccines are commonly prepared. Recent studies have demonstrated the possibility of removing the paralysis-producing properties from brain tissue material used for vaccine production.

I wish to quote directly that portion of the report of the Expert Committee dealing with the control of rabies in animals:

"It is recognized that rabies exists in two epizootiological forms: (1) a widely disseminated disease propagated principally in dogs, predominantly in urban regions; and (2) a more localized disease of wild animals, particularly in wolves, foxes, jackals, vampire bats, and mongoose.

"The application of known effective measures for the elimination of rabies from the dog population constitutes the most challenging problem at this time in that this animal is the principal source of human infection.

"The committee has considered the answers to the questionnaire concerning the control of rabies in animals, and noted the general agreement on the main principles to be applied in rabies control. On the other hand, there are wide differences of opinion expressed with regard to fundamental details such as the length of quarantine periods, and the testing and application of veterinary vaccines. The committee wishes to record, therefore, their recommendations on these various problems, with the realization that the application of the various measures proposed will have to be adapted to local conditions.

"The committee recognizes the distinct value of periodic, compulsory, prophylactic
lactic vaccination of dogs against rabies and recommends its use in areas in which
the disease is enzootic.

"During the past ten years carefully controlled experiments have demonstrated
the value of a single dose of either living or inactivated virus vaccine, repeated an-
nually. From a practical point of view, the efficacy of this procedure has been cor-
rborated by the extensive and successful field use of inactivated virus vaccines in
the United States, and the continued success with living attenuated virus vaccines
in Hungary.

"The committee recommends that vaccines be subjected to adequate tests for
potency. It is of the opinion that the presence of live virus in vaccines is not of itself
sufficient proof of antigenicity and recommends the use of the potency mouse test
(Habel) for both living and inactivated virus vaccines. The committee appreciates
the fact, however, that the promising new avianized live virus vaccine (Flury strain)
appears to present a different problem in potency testing which, however, has now
been adequately met. This vaccine has proved to be highly antigenic in tests in guinea
pigs and dogs.

"The committee recommends that where feasible a biting animal should be kept
under observation for a period of 10 days. If the animal shows no signs of illness dur-
ing this period, it can safely be assumed that the animal was non-infective at the time
of biting.

"The committee further recommends that during an outbreak of rabies, if general
restrictive measures alone are depended upon in an involved area, dogs should be
restrained (leashing, secure confinement) for a minimum period of 90 days from the
date of the last known case of rabies. Where, in addition to restrictive measures,
vaccination of dogs is carried out, the period of restraint may be reduced to 30 days
after vaccination. The restraint of domestic cats is not feasible.

"The committee recommends that dogs and cats bitten by a rabid animal should
be destroyed. If the owner is not willing to destroy the exposed animal, the fol-
lowing alternatives are recommended:

a. Strict isolation of the animal in a kennel for a period of 6 months.

b. If no previous vaccination has been given within a period of 12 months, vac-
cinate and confine in a kennel for 3 months.

c. If the animal has been previously vaccinated within 12 months, revaccinate and
restrain (leashing, secure confinement) for 30 days.

"As regards domestic livestock exposed to rabies by bite, it is recognized that
these animals will probably not propagate rabies. Exposed animals can be slaughtered
for meat purposes within one week of the bite, or after six months. It should be noted
that the greatest risk in dealing with exposed livestock is the danger encountered
by people handling the live animal or the carcass, and not through the consumption
of meat or milk from infected animals. The committee does not feel it possible to
make any specific recommendation with respect to the vaccination of large animals
following exposure, because of the lack of controlled experiments.

"The committee recognizes that countries now free of rabies should continue
either to prohibit importation of dogs and cats, or subject them to a prolonged period
of quarantine, preferably six months, at the port of entry. In the case of countries
with extensive land borders, and where rabies is already present in domestic or wild
animals, it is recognized that such strict quarantine measures are impracticable.

"There can be no objections to the importation of dogs from countries free of rabies
provided they have been isolated en route.

"Dogs originating in infected countries should be vaccinated within 12 months
before departure, and revaccinated as soon as possible after arrival, by whatever procedure is practical in a particular area.

"These recommendations are made with the consideration of varied conditions encountered throughout the world, and should not be construed as discouraging more stringent measures, such as quarantine periods upon entry, with (preferably) or without vaccination.

"Experience has shown that the efficient organization of a rabies control programme in an infected area is best accomplished by means of a central authority headed by a public-health officer, preferably a veterinarian, who has full executive power and who devotes his full time to this work. A system of weekly reports of rabies cases should be instituted in order to enable the officer to keep abreast of the problem. This officer should enlist the support of all local groups directly or indirectly concerned with rabies, such as public health authorities, veterinary and medical practitioners, livestock organizations, animal protection societies, etc. These groups can provide material assistance to the rabies-control officer by publicizing the programme and otherwise informing the general public whose co-operation must be obtained before specific measures can be successfully applied. If possible, an antirabies campaign should be co-ordinated on a national basis, or at least in adjacent infected areas.

"The committee recommends that the following specific measures be applied in affected regions:

1. Registration, licensing, and taxation of dogs.
2. Elimination of stray animals.
3. Restraint of dogs while the control campaign is under way.
4. Mass vaccination of dogs free of charge.
5. Provision of adequate facilities for diagnosis.
6. Reduction in number of wildlife species where these are a reservoir of the disease.
7. A continual and energetic publicity campaign."

The committee expressed its agreement with the almost unanimous opinion expressed in replies to the questionnaire concerning the desirability of regional meetings for the control of rabies. It strongly recommended that the World Health Organization should arrange regional meetings of appropriate authorities from neighboring and nearby countries where rabies is a problem so that concerted attacks on this disease will be possible. It was felt that regional meetings would provide an opportunity for demonstrating the latest laboratory and field control procedures concerning rabies, as well as promoting joint action in limiting the spread of the disease.

It was felt that the World Health Organization would be making a definite contribution to the control of rabies on an international basis if it were to sponsor a programme of rabies control in dogs in some area where canine rabies is enzootic. Action was taken to implement this recommendation. The Committee recommended the use of the avianized virus vaccine in this demonstration because it had been adequately tested for safety in thousands of dogs in the field and shown to have high immunizing capacity in thorough laboratory experiments. The occurrence of occasional cases of postvaccinal paralysis among dogs immunized with either living or inactivated virus vaccine prepared from animal brain tissue was an important factor in the decision to recommend the avianized virus vaccine for the
field trial because no cases of postvaccinal paralysis have been observed among dogs immunized with this vaccine. There was also the advantage of preservation of the avianized virus vaccine by storage in the dried state which made it particularly suitable for use in tropical regions.

Rabies is one of a small number of disease problems that have been chosen for study by the World Health Organization. The choice of this disease fits in with the policy outlined by the Executive Board to concentrate at this time on those diseases where the application of existing knowledge to public health administration might prove most effective. The Pan American Sanitary Bureau has already begun implementing the recommendations of the World Health Organization on rabies control. A veterinary public health officer from the Pan American Sanitary Bureau was dispatched to Puerto Rico during 1950 to assist the U. S. Public Health Service and the Puerto Rican health authorities in combating an outbreak of rabies. The epidemiological investigations that have been completed suggest that the disease may have become established in the mongoose population. A regional rabies conference for the Caribbean area, sponsored by the Pan American Sanitary Bureau, was held in Kingston, Jamaica, August 28–30, 1950. Representatives from Puerto Rico, Cuba, Jamaica, Haiti, the Dominican Republic and Trinidad were thus brought together to discuss their mutual problems with rabies and to hear from expert consultants about recent developments in the fields of diagnosis, immunization, stray dog control and wildlife control as applied to rabies. In Trinidad there is the problem of preventing the reintroduction of vampire bat rabies, which, you will remember, caused extensive losses among livestock and many human fatalities from paralytic rabies in the early '30s. Though the last known case of paralytic rabies among livestock occurred in 1942, the authorities in Trinidad have continued the program of destroying vampire bats which continue to migrate to the island from the mainland of South America.

Vampire bat rabies continues to cause extensive losses among cattle and other livestock in Mexico. Studies of the northernmost distribution of vampire bats is an important part of the joint United States–Mexico rabies control program now being sponsored by the Pan American Sanitary Bureau.

It is hoped that the recommendations of the Expert Committee on Rabies of the World Health Organization will prove useful to the authorities that are responsible for rabies control in the United States. The report may be cited to refute criticism of the adoption of certain specific measures which we know are necessary in order to eliminate rabies from the dog population and to contain the disease in wild animals pending the development of better methods for attacking this problem.

As we learn more about the wild animal rabies problem in the United States, we can see the necessity for ecological studies to determine the relative importance of various wild animal vectors in the maintenance and spread of the disease. The epizootic of fox rabies that has been migrating about the eastern half of the United States for the past 10 years shows no immediate prospects of containment and has left many enzootic foci of the disease which continue to flare up from time to time. Reduction of the number of foxes in an infected area has proved effective in eliminating the disease there, but with few exceptions the policy has been to wait until
the disease appears before considering to limit the fox population even if the disease is nearby. Thus, the disease is often one jump ahead of the control work. A reduction of the population of foxes over a large area has proved very successful in dealing with the recent epizootic of fox rabies in east Texas. In western United States the coyote has been the principal wild animal vector of rabies. The epizootic of coyote rabies that developed in California, Oregon, and Nevada in 1915 and 1916 led to the adoption of a coyote control program in these as well as adjoining states. The outbreak of coyote rabies which occurred in New Mexico in 1943 stimulated a more active coyote control program in southwestern United States and the disease does not appear to be active among coyotes in this region at the present time. In Iowa and Wisconsin there are a few regions where there have been sporadic cases of skunk rabies for many years. Skunk rabies was once a serious problem in Kansas and Arizona, and small spotted skunks are referred to as “phobey cats” in western United States because they were known to have been the source of hydrophobia or rabies in human beings.

As was mentioned previously, we have several common wild animal vectors of rabies which we recognize by their spectacular behavior when they develop the disease. The presence of rabies infection in vectors such as foxes is readily apparent because rabid foxes are apt to become very aggressive and will invade human habitation during the daytime and attack man and domestic animals. The wild canines such as foxes and coyotes feed on various small animals, and it is necessary to consider the possibility of a reservoir of sylvatic rabies in wild rodents. We know that at least one small mammal, the vampire bat, can harbor rabies virus in the salivary glands as a symptomless infection.

In order to have an effective rabies control program, it should be co-ordinated on a national basis. Progress is now being made in this direction through the activities of the Veterinary Public Health Division of the U. S. Public Health Service by assisting states in developing well organized state-wide rabies control programs and co-ordinating these in a uniform pattern.
REPORT OF COMMITTEE ON RABIES


Your Committee can report increased interest and activity in efforts to control and eradicate rabies. Programs in the United States continue to be sponsored, in the main, at the local and state level. The overall Federal coordination through the U. S. Public Health Service, the Fish and Wildlife Service, and the Bureau of Animal Industry, has not been completed.

International interest in rabies control is evidenced by the report presented by the previous speaker on the meetings held on the subject by the World Health Organization in Geneva in April, 1950.

The development of avianized, of ultraviolet treated and of benzine extracted vaccines has revived interest in comparative studies of the effects of the injection of these materials and of the length of immunity produced. The work of Habel at the National Institutes of Health on the elimination of the paralysis factor from virus-bearing brain vaccines has likewise introduced new factors deserving of extensive trials.

Immunity studies have not progressed sufficiently beyond the one-year period to allow challenge at two years. No reports are possible on the total length of the immune period produced by the newer vaccines.

Your Committee is of the opinion that a resistant period of more than a year, but short of lifetime protection, will confuse the public and seriously interfere with control programs incorporating annual mass vaccination. Data should be carefully analyzed and presented, so that the value of vaccination in control programs may not be brought into disrepute. It will be difficult for the general public to remember when revaccination is needed, should the resistant stage last two or three years.

There follows a report on the incidence of rabies in the United States for the calendar year 1949, as prepared by the Bureau of Animal Industry, U. S. Department of Agriculture.

INCIDENCE OF RABIES IN THE UNITED STATES—CALENDAR YEAR 1949

Statistics on the number of cases of rabies in the United States in the calendar year 1949 have been collected by the Bureau of Animal Industry of the U. S. Department of Agriculture.

There were 7,597 cases reported. There were 5,237 cases in dogs, 639 in cattle, 24 in horses, 22 in sheep, 54 in swine, 413 in cats, 6 in goats, 1,192 miscellaneous, and 10 in man.

This material was compiled from a questionnaire sent by the Bureau to the livestock sanitary official and the health officer in each State. In some instances, data from both sources in a State were used. When there was a difference in the number of cases reported for the same species, the greater number was used, since it is believed that the reported cases do not represent all of the cases that occurred.

Table I gives the number of cases reported in each State by species.

The map on page 216 shows the distribution of the cases by States.
### Table I: Rabies in the United States by States During the Year 1949

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<td>28</td>
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<td>Iowa</td>
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<td>3</td>
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<tr>
<td>New York State</td>
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<td>172</td>
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<td>20</td>
<td>319</td>
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<td>North Carolina</td>
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<td>15</td>
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<td>22</td>
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<td>1</td>
<td>373</td>
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<td>Texas</td>
<td>714</td>
<td>50</td>
<td>1</td>
<td>3</td>
<td>768</td>
</tr>
<tr>
<td>Utah</td>
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<td>0</td>
<td>0</td>
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<tr>
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<td>Virginia</td>
<td>66</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>73</td>
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<td>Washington</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>West Virginia</td>
<td>208</td>
<td>6</td>
<td>0</td>
<td>10</td>
<td>225</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
</tbody>
</table>

| Total             | 5,237| 639  | 24   | 54  | 6,426 |

*Includes coyote, fox, rabbit, mouse, gopher, ground squirrel, rat, squirrel, skunk, wild cat, raccoon, opossum, muskrat, and deer.
CASES OF RABIES REPORTED IN VARIOUS STATES IN 1949

TOTAL CASES REPORTED: 7,597
MORTALITY AND MORBIDITY DATA IN BRITAIN

A. W. STABLEFORTH, M.R.C.V.S., Weybridge, England

When the Chairman of your Committee on Mortality and Morbidity, Dr. Schroeder, hearing I was to be in the United States of America invited me to attend your meeting here and later, to tell you a little about similar matters in Great Britain, I accepted with pleasure. It was however with some surprise that I received his next letter telling me that 15 to 20 minutes would be reserved for me in the programme and that my contribution for the printed report could be much longer if I wished. Gentlemen, I shall be able to say all I wish or need within less than a quarter of an hour.

SCHEDULED OR NOTIFIABLE DISEASES

In Great Britain we are proud of the way in which we have been able to eradicate the more contagious diseases and to control others. We are well favoured in our circumstances in this respect though we have to import much meat and with it disease. We are an island, small and compact enough to make central coordination practicable, we have no interstate rivalries and loyalties to challenge it and we have a series of regulations drawn together in the Consolidated Diseases of Animals Act of 1894 and subsequent Acts and Orders, which have been operated in the same way for so many years, that their value is generally recognized and they are rarely disobeyed. The acts provide ample powers for any likely event, but it cannot be too strongly emphasized that these powers derive from the wishes of the farmers and owners of animals to have disease effectively controlled and would be worse than useless if they had not their support. I need not stress the importance of this to you in a country which has realized and stressed the importance of public education and extension work in these matters for so many years.

The diseases scheduled under these acts and orders are regularly and promptly reported and we have therefore accurate statistics regarding the number of outbreaks and animals (or birds) concerned and the compensation paid. The mechanism is fairly simple. Any person owning or in charge of an animal suspected of a notifiable disease (this includes a veterinarian who sees a case) must report it to the nearest police constable who will in turn notify the Ministry's Divisional Veterinary Officer and the Inspector of the Local Authority and in certain cases the Medical Officer of Health. The diagnosis is then made locally, with confirmation by the central laboratory of the Animal Health Division at Weybridge in diseases where this is necessary.

The diseases scheduled are shown in Table I which is an example of the summary published fortnightly. The top half of this summary provides statistics of the scheduled diseases which still occur in Great Britain. It will be seen to contain:

(a) Returns for the previous fortnight;
(b) Cumulative data since the beginning of the year, and
(c) Those of the similar period in the three previous years—and this particular summary, being the last of the year, contains the cumulative totals for the whole of the year concerned and those of the previous three years.
Table I
Summary of Returns of outbreaks of certain scheduled (notifiable) diseases which have been confirmed by the Ministry during the period 16th to 31st December, 1949

<table>
<thead>
<tr>
<th>Period</th>
<th>Anthrax</th>
<th>Foot-and-Mouth Disease</th>
<th>Fowl Pox</th>
<th>Parasitic Mange*</th>
<th>Sheep Scab</th>
<th>Swine Fever</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outbreaks confirmed</td>
<td>Animals attacked</td>
<td>Outbreaks confirmed</td>
<td>Animals attacked as suspected or exposed to infection</td>
<td>Outbreaks confirmed</td>
<td>Animals attacked</td>
</tr>
<tr>
<td>Period 16 to 31st December 1949...</td>
<td>20</td>
<td>23</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Corresponding period in 1948...</td>
<td>8</td>
<td>15</td>
<td>3</td>
<td>132</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Corresponding period in 1947...</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>31</td>
<td>48</td>
<td>17</td>
</tr>
<tr>
<td>Corresponding period in 1946...</td>
<td>4</td>
<td>4</td>
<td>13</td>
<td>1,070</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Total 1st Jan. to 31st December, 1949...</td>
<td>244</td>
<td>262</td>
<td>15</td>
<td>3,034</td>
<td>582</td>
<td>46</td>
</tr>
<tr>
<td>Corresponding period in 1948...</td>
<td>118</td>
<td>128</td>
<td>15</td>
<td>1,592</td>
<td>267</td>
<td>69</td>
</tr>
<tr>
<td>Corresponding period in 1947...</td>
<td>121</td>
<td>139</td>
<td>104</td>
<td>10,921</td>
<td>2,222</td>
<td>103</td>
</tr>
<tr>
<td>Corresponding period in 1946...</td>
<td>95</td>
<td>98</td>
<td>54</td>
<td>5,642</td>
<td>-</td>
<td>94</td>
</tr>
</tbody>
</table>

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Note.—The following diseases were eradicated from Great Britain in the years indicated:—Cattle plague or rinder-pest (pestis-bovina), 1877; pleuro-pneumonia (pertepneumonia contagiousa bovum), 1898; sheep pox (variola ovium), 1850; rabies, 1922; epizootic myxangitis (lymphangitis epizootica), 1906; and glanders (including faccy) (malleus), 1928. Durine (ezanthema cutane paralyticum) has never existed in Great Britain.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, i.e., herds officially certified as free from Tuberculosis as at 31st December, 1949, was as follows:

<table>
<thead>
<tr>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Total (Great Britain)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15,838</td>
<td>13,818</td>
<td>12,263</td>
<td>44,839</td>
</tr>
</tbody>
</table>

Ministry of Agriculture and Fisheries,

(67588) 900
It will be seen that we still have a small number of "outbreaks" of anthrax each year, usually confined to one animal and a small but decreasing number of outbreaks of sheep scab, whilst parasitic mange (in horses) has disappeared. Foot and Mouth disease continues to be introduced and a source of anxiety, though in recent years outbreaks have been few. Fowl pest i.e. Newcastle disease (not fowl plague) appeared in 1947 after 14 years of freedom. Swine fever dropped sharply from 1946 to 1949 and for many years before this, but has risen again in 1950. It will also be seen that the following scheduled diseases have been absent since the years stated; cattle plague (1877), pleuro-pneumonia 1898, sheep pox 1850, rabies 1922, epizootic lymphangitis 1906 and glanders 1928; and that dourine has never been present. Certain (open) forms of tuberculosis are also scheduled and data are appended periodically to this summary, as are also the current figures for the tuberculosis (attested herds) schemes, which it will be seen contained 44,889 herds at December, 1949. At September 1950 this had increased to 52,482 herds with 2,042,270 cattle or 22 per cent of all cattle in Great Britain and in October 1950 an area scheme with provisions similar to your own accredited herds plan was introduced. We are hoping to emulate your success.

As a basis for comparison of the above figures with your own, it may be useful to add that, at the last annual livestock census (June 1950) for Great Britain, cattle and calves totalled approximately 9½ millions, sheep and lambs nearly 20 millions, pigs 2½ millions, and poultry 75 millions.

NON-SCHEDULED DISEASES

Our statistics regarding the non-scheduled diseases are less adequate. Interest in their overall national incidence and the loss they cause was restimulated at the beginning of the last war when the Survey Committee (now the Technical Committee) of the National Veterinary Medical Association of Great Britain and Ireland (N.V.M.A.) needed to assemble data on which to base a drive for the better control of some of the commoner diseases of cattle. It was realized that we had valuable statistics regarding certain diseases, but that they were based on relatively small samples of the cattle population and were in many cases taken from herds which had sought veterinary help on a particular disease and were therefore likely to have a greater amount of that disease than other herds. Thus, whilst we had data based on some 300 lactations to show the loss of milk caused by Streptococcus agalactiae mastitis and had figures for incidence based on a large number of herds, most of these had sought help because they were diseased and we did not know the incidence of S. agalactiae or any other mastitis infection in the country as a whole. This particular gap is one which we are now rapidly filling. Similarly, whilst we had information on calf losses, based on over 30,000 pregnancies, covering the country, these contained a figure for abortions, we had a relatively much smaller volume of data regarding the milk loss following abortion. Again, we knew that some areas were heavily infected with tuberculosis and others were nearly free, but we had until recently insufficient figures for large areas. Finally, there were many diseases, e.g. infertility, for which we had no accurate data. Some local surveys of a more random nature had been made but they were concerned more with deaths and disposals than with the loss of milk or meat which is the main factor in some of the
most widespread diseases now left in our respective countries. Finally, we had no regular year to year information of a kind which would enable us to assess the value of the introduction of a new vaccine or treatment quickly unless it was unusually outstanding.

It was agreed on all sides that reliable information on a sufficiently large cross section of the animal population would be of the greatest service in the following ways:

1. to demonstrate the national incidence and economic importance of the more common diseases, acute or chronic.
2. to indicate in what direction new investigations should be directed or extended.
3. to suggest where control or treatment measures could most profitably be instituted.
4. to provide a measure of the overall effectiveness of those control or treatment measures which from time to time gain currency for a particular disease.
5. to show any way in which changes in methods of husbandry or farm practices affect the incidence or severity of any particular disease.

Consideration of the subject soon showed that collection of data from even a small sample of herds was going to take much time and it was decided to confine the work in the first place to dairy herds and to try to collect data from 2,000 to 3,000 herds, representative of different area and kinds of herds. It was realized also, that whilst close veterinary supervision was essential, herds could not be visited more than once every 3 months and that even if lay collectors of morbidity and mortality statistics could be adequately trained and used, it was the owner or his herdsmen on whom the outcome of the scheme would depend.

It was decided that the only satisfactory way of operation on the farm was to provide a working card (or form) on which could be recorded any event of importance on the day on which it occurred. At one stage a small pocket card was favoured, but eventually it was decided to provide for each herd a large card (or cards for a large herd) of the kind illustrated. This is hung, or fastened to a board, in the cowshed and filled in by the owner or whoever is in the cowshed daily. Any event of the kinds mentioned at the top of the card is entered on the day it occurs and is dated. It may be a disposal, an abortion, a normal service, a few clots in the milk with reduction of yield or an attack of ketonaemia in a cow, husk in yearlings, diarrhea in a calf or indigestion in a bull. Some record of the course of the disease is also kept and when recovery occurs its date is recorded. If the veterinarian operating the scheme is the veterinarian who usually attends to disease in the herd he can have a look at the form from time to time, discuss reasons for disposal, assess milk loss from a given event, add a note regarding confirmation of diagnosis from a laboratory and so on. If the veterinarian responsible is not the herd veterinarian but one employed whole time on the collection of disease statistics, he will of course need to see the herd veterinarian from time to time and to arrange for him to provide the owner with a sufficient diagnosis in the ordinary case. In addition to the farm card, there are forms for recording once a year, details of husbandry and, every three months the number of animals of each age class. Our National Veterinary Medical Association is now operating a scheme with a number of veterinarians who have enrolled some of their clients, whilst at the Ministry of Agriculture Cen-
FARM ECONOMICS FORM

*Veterinary Surgeon's Initials and Index No.*

Fill on first visit and correct annually

<table>
<thead>
<tr>
<th>Acreage</th>
<th>Permanent</th>
<th>Quality</th>
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</thead>
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<td>........</td>
<td>............</td>
<td>..........</td>
</tr>
<tr>
<td>Acreage grazed by cattle</td>
<td>...........</td>
<td>..........</td>
</tr>
<tr>
<td>Feed purchased</td>
<td>...........</td>
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<table>
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<tr>
<th></th>
<th>No.</th>
<th>Breed</th>
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<th>Breeding</th>
<th>Grazing periods</th>
<th>Feeding</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cows</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In calf heifers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearlings</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Heifer calves</td>
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</table>

<table>
<thead>
<tr>
<th>Ewes</th>
<th>Hogs</th>
<th>Fattening cattle</th>
<th>Pigs</th>
</tr>
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<table>
<thead>
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<th>Stripping</th>
<th>Recording</th>
<th>Av. milk</th>
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<td></td>
<td></td>
<td>Summer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Winter</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Milk disposal</th>
<th>Normal sale of cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vaccinations and tests conducted

<table>
<thead>
<tr>
<th>1st calf</th>
<th>2nd calf</th>
<th>3rd calf</th>
<th>4th calf</th>
<th>5th calf</th>
<th>Old cow</th>
</tr>
</thead>
</table>

Age distribution

of cows

223
Form 3

6-MONTHLY RECORD

_Veterinary Surgeon's Initials and Index No.______________

(To be filled at the farm by the recorder)

Give ages of affected animals. Give what is known of the cause of loss of milk in individual cows and give extent of the loss.

<table>
<thead>
<tr>
<th></th>
<th>No. at last record</th>
<th>No. now</th>
<th>Loss or disposed of</th>
<th>Infertility</th>
<th>Abortion</th>
<th>Loss of condition or of milk</th>
<th>Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows (including 1st calvers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Served heifers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Yearlings</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Heifer calves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vaccination and tests.................................................................................................................

Mastitis control...............................................................................................................................

Other health measures.....................................................................................................................

At the beginning of this year we began a pilot experiment in two counties with a little over 1,000 and 1,200 herds respectively.* We decided that our aim should be

* I would acknowledge here my indebtedness to Mr. F. W. Withers who is undertaking and developing this survey.
to end up with data from a representative 5 per cent of herds and with this end in view we began with 6 to 7 per cent, in order to allow for those which would fall by the way. Selection of herds was so arranged (layered) that we had a representative proportion of (a) "attested" (i.e. tuberculosis free), tuberculin tested and other herds, and (b) small, medium and large herds. Otherwise herds were chosen at random by taking cards at fixed intervals from the alphabetical lists of herds maintained at our divisional offices; the next card being taken if an owner would not cooperate and so on. The response was good and each of over 60 herds in the county of Surrey and 70 herds in Berkshire with totals about 4,000 and 6,000 bovine animals respectively, are being visited once every three months. It appears that this number of herds are about as much as one man can deal with, if he is to have sufficient time to assemble and analyse his data.

Diagnosis is in most cases a clinical one but in both counties there is a laboratory where confirmatory examinations can be made. For Surrey there is the Weybridge laboratory, whilst for Berkshire there is one of the thirteen provincial laboratories which we maintain to cover the various areas of England and Wales. Diagnosis at these laboratories is on a fairly uniform basis because the veterinarians in charge meet three times a year in conference and with their assistants once, whilst all new recruits now have a year at the Weybridge laboratory before they go to the provincial laboratories, or Veterinary Investigation Centres as we call them. In Scotland there are four other laboratories of the same kind.

It is of course, much too early yet to give you any opinion on the fruitfulness of the scheme but it seems to be working well and has already served to show up the loss of milk which may occur from such common things as "indigestion" or "foul of the foot" if not treated promptly. In fact in this way alone it may do considerable good.

In conclusion, great strides have been made in controlling many of the more serious animal diseases but if we are to push on with this task so that it will be done in a way which will be increasingly profitable to the producer and the consumer it must have the best possible planning and direction and for this adequate morbidity and mortality statistics are essential.
REPORT OF THE COMMITTEE ON MORBIDITY AND MORTALITY 1950

C. R. SCHROEBER, Pearl River, New York, Chairman; A. P. SCHNEIDER, Boise, Idaho; R. C. NEWTON, Chicago, Illinois; F. D. McMahon, Phoenix, Arizona; T. B. CLOWER, Atlanta, Georgia; M. E. KNICKERBOCKER, Salem, Oregon; L. L. BREECK, Frankfort, Kentucky; C. E. WICKTOR, Los Angeles, California

The objectives of this Committee, as set forth in the 1949 report, were:

1. To secure the approval of the special request in the 1951 budget of the United States Bureau of Animal Industry for the establishment of a section on vital statistics.

2. To expedite publication and distribution of:
   a. A manual on nomenclature
   b. A manual on the diagnosis and epidemiology of economic and transmissible diseases of animals.

3. To prepare the practicing veterinarian and the veterinary student through all available means and agencies to freely give honest and complete reports to the chief livestock sanitary officials on morbidity and mortality within his state.

4. To continue to encourage support of and interest in the program for gathering vital statistics. To this end, the Committee recommended that colleges of veterinary medicine consider the incorporation of vital statistics in the curriculum to acquaint the veterinary student with the part that he will play in being the initial source of morbidity and mortality data, to imbue him with his obligation, to teach him to properly interpret and evaluate statistical data which will be made available to him as a result of his effort.

The budget request made through the United States Bureau of Animal Industry for the establishment of a Section of Vital Statistics was not granted. A formal statement has not been issued from any source to the knowledge of this Committee indicating cause for disapproval. It was inferred, however, that budgets are being cut, not expanded, and that, because of the emergency state, funds could not be set up for new activities.

The primary objective of this Committee is to have data on morbidity and mortality of domestic animals of the United States and possessions made available in printed form to all those who have a primary interest in animal disease. To secure further support of this program a letter requesting endorsement in principle was sent to a mailing list consisting of:

- 27 Feed Manufacturers
- 53 Experiment Station Directors
- 59 College Presidents (Land Grant) and Deans of Colleges of Agriculture
- 17 Deans of Veterinary Colleges
- 7 Meat Packers
- 71 Breed and Grange Associations
- 48 Farm Bureaus—National and State
- 20 Pharmaceutical and Biological Manufacturers
- 48 State Veterinarians

The letter asked for approval of a program concerned with the collection, assembling, printing, and distribution of morbidity and mortality data in domestic animals, in principle. How, where and by whom this is to be accomplished is not of
prime concern to this Committee. The following are direct quotes from replies now in the possession of the Secretary of the United States Livestock Sanitary Association. Without a single exception, now or in the past, all individuals and organizations approached agree to the program in principle. Following are representative replies.

Dean, Veterinary College: "We believe that veterinary medicine and animal disease control are handicapped by the absence of more complete information on morbidity and mortality statistics of animals. Without such knowledge, it is difficult to plan control and eradication programs on a state or national basis. The cyclic nature of animal disease has been indicated in the past, but no real knowledge about the peak of cycles is available. Biological laboratories find it difficult to prepare immunizing and other therapeutic agents in advance of actual needs because it is impossible to predict the epizootics of infectious diseases. While morbidity and mortality reports would not entirely predict the occurrence of epizootics, they would be of great aid.

"The geographic prevalence of disease of all types is not known to any exact degree. Obviously, this is a handicap to control officials as well as to others in the profession. This becomes particularly obvious in teaching when students question the meager reports which are available. Complete reporting of diseases would be of aid to colleges of veterinary medicine. Too much time may be devoted to the discussion of certain diseases while others possibly are more important on the basis of prevalence and are neglected. Practically the only reports available at this time are concerned with the infectious diseases. Nutritional diseases usually are considered non-reportable; consequently, there is definite absence of any knowledge concerning the geographical occurrence and seasonal prevalence of such diseases.

"We consider that the development of a system which would provide reliable morbidity and mortality statistics is one of the essential needs of veterinary medicine. In order to realize this fact, one needs only to become acquainted with the statistics available for the illnesses and deaths of man and the value of such statistics in human medicine and public health."

President, Feed Mill: "We are not in favor of creating an additional agency since there are already 1863 bureaus, agencies and administrations functioning in our government today, employing two million civilians, as compared with the employment of over 600,000 prior to the war—so we have approximately one million and a quarter dead-heads on the government payroll and, with the need for more taxes, I do not believe that we can consistently ask for anything at this time that will add to government spending which can be deferred or eliminated. No greater service can be rendered to our country, however, than the elimination of the unneedful, wasteful, tax-absorbing agencies and the conversion of those remaining to handle worthwhile budgets such as your committee is endeavoring to establish and which will contribute to the needed assistance for improving the health of our animal population so necessary to our domestic economy."

Director, Farmers' Cooperative: "It appears to us that transfer of funds from some of the extensive crop-supporting activities of the Federal Government to projects such as this would be of long time benefit both to the farmers of this country and to the consumers of food produced by those farmers. This information should result in lower losses through diseases to farmers with resultant lower cost in production and lower cost to consumers.

"We feel that we should not ask for additional funds from Congress to cover new
demands, but we should ask for the most effective use of funds available and that part of the funds now used to purchase surplus farm products could probably be used for programs of this nature."

**Vice-President, Feed Mill:** "We find that completed, detailed knowledge of the incidence of diseases and deaths in our livestock, and where these losses occur, is completely lacking. We can be industrially strong in direct proportion to our agricultural strength and this condition needs not only attention but correction."

**Manufacturer, Biological and Pharmaceutical Products:** "We have given this subject no small amount of study over the past 25 years, not only at the local and state, but also at the national level. The end conclusion is that such activity is probably an obligatory function of government, and that compilation of this data is practical only when continuously carried on in every state under national guidance."

"In the true essence of things, it is both foolish and extravagant to spend millions of dollars for control of animal diseases without having comprehensive data on the occurrence of such diseases. All of us who have studied this problem believe with assurity that the expenditure for maintenance of a vital statistics division on animal diseases would not only be a good investment but would show our nation a nice profit annually."

**Director, State Experimental Station:** "A healthy livestock population is of particular importance at this time, when, because of the critical world situation we will undoubtedly be called upon for increased production, and conservation of foods of animal origin.

"To regulatory officials, research men and veterinary practitioners a knowledge of the incidence and geographical occurrence and rate of spread of animal diseases is a necessity, if adequate control measures are to be initiated before it is too late.

"Many of the present, nation-wide infectious diseases of food-producing animals might have been eradicated if sufficient information as to their occurrence had been made generally available when these diseases were initially introduced or first diagnosed."

**State Veterinarian:** "The present world situation, we feel, actually calls for impetus in this regard rather than inattention. Those of us familiar with contagious diseases certainly are vitally concerned, if not somewhat alarmed at the dreadful possibility of bacterial warfare. An efficient and prompt method of reporting animal disease is certainly the most effective means of intercepting enemy action in this regard, especially in the case of introduction of foreign diseases, most of which we are not familiar with. Great progress can only be made in this endeavor if such a regulatory agency is established, which would greatly aid our public health and livestock industry."

**President, Land Grant College:** "The information on diseases and death of livestock would be invaluable to land grant colleges and other agricultural agencies, and it would aid in training agricultural students and informing agricultural workers and farmers of the state."

**Secretary, Breed Association:** "If we cannot keep our livestock healthy and alive, the best in feeding and animal breeding programs will be worthless. Unless you can find facts as to what is causing these losses and where they are incurred, we cannot combat them systematically and efficiently."

**Livestock Sanitary Inspector:** "Our livestock department, due to heavy importations of livestock into this area from various sections of our country, is greatly interested in diseases that may occur in regions where importations originate. The only means of obtaining accurate knowledge of such existing diseases is from a report on
a nation-wide basis, preferably submitted by the United States Department of Agriculture, which is the national agency responsible for the control of animal diseases."

**Director, State Experiment Station:** "Morbidity and mortality statistics for domestic animals by individual states and for the country as a whole are either unavailable or unreliable at the present time. Under existing regulations, the veterinarian is required to report certain communicable diseases, but such reporting is uncertain and unenforceable in most instances. No provisions are made for reporting the non-contagious parasitic and nutritional diseases, and the losses resulting from faulty management, and allied conditions, although known to be large, are never reported.

"While the direct death loss from disease is large, there is little question that the direct loss in lowered meat, milk, egg and animal-fiber production is even greater. It is well to bear in mind that the death loss of young animals on the farms and ranches of this country between birth and weaning age has been reliably estimated at 18% of the total number born. No industry can continue to function on a sound basis with such losses.

"Since many animal diseases are directly or indirectly communicable to man, it is obvious that the public health is involved in the problem.

"Machinery to collect, assemble and digest mortality and morbidity statistics for domestic animals at both the state and national levels is essential to an intelligent, concerted attack aimed at reducing the known economic losses and protecting the public health. The fact that the U. S. Livestock Sanitary Association, the American Veterinary Medical Association, the Division of Biology and Agriculture of the National Research Council, and the American Medical Association are interested in and concerned with the problem is convincing evidence that the establishment of vital statistics for domestic animals is immediately important and necessary."

**Director, Biological and Pharmaceutical Manufacturing Organization:** "Without a question, if this information were available, it would very materially assist the production problems in the field of animal food production, the same as the type of information they have at the present time on the factors of vegetable food production and destruction. I feel that it is just as essential that we should be entirely familiar with and anticipate the possible problems of losses in our various types of food-producing livestock as it is to have this information from the standpoint of truly vegetable or agricultural foods, and hope that your Committee can point out these factors sufficiently forcefully to the authorities in Washington to possibly have this small expenditure included in one of their emergency appropriations."

2. We have been told that progress has been made in the last year concerning the setting up of the "Manual on Nomenclature" by the A.V.M.A. Committee.

Dr. K. F. Meyer, Director, The George Williams Hooper Foundation, has given much time and thought to the preparation of a manual concerned with the diagnosis and epidemiology of economically important transmissible disease of animals. Dr. Meyer has indicated that he feels it would be wise to first prepare a manual dealing with perhaps twenty of the most important infectious diseases rather than to prepare, at this time, an all-inclusive manual.

3 and 4. A letter was sent to the deans of all colleges of veterinary medicine in the United States and Canada, proposing the inclusion of Vital Statistics appreciation in the curriculum.

The following replies are representative:

"I teach infectious diseases to our students with special reference to epidemiology and control, and I always speak on these matters in order to alert them to the desira-
bility, if not the necessity, of reporting at least the more serious diseases that they 
see in practice. I am willing to continue doing this and perhaps bear a little more 
weight on it. I hope that in due time we may develop an organization that will collect 
better statistics. The trouble with most of our statistics-gathering organizations in 
the past is that they have gathered statistics and filed them away, and the persons 
who supplied them seldom heard any more about them after they were sent in. On 
that basis people soon lose interest in sending them in. One should reply to these 
persons in some systematic way in order to keep up their interest."

"I feel quite certain that when the manual which Dr. Meyer is preparing is avail-
able, it would be possible for us to incorporate it into our curriculum. I do not know 
that we will be able to list it as a separate course, but it would be quite easy to in-
corporate it in our course in senior medicine."

"I feel it will be fine for the U. S. Bureau of Animal Industry to establish a Section 
on Vital Statistics. This could start at once in a crude sort of way and improve with 
time. Improvement will depend upon obtaining a nomenclature of causes of morbid-
ity and mortality. This nomenclature problem is a gigantic task. You will remember 
that DuToit worked this up in South Africa and presented the world's first effort in 
print at the Veterinary Congress meeting in Zurich in 1938. Following that, the 
A.V.M.A. appointed a Committee to work this up as an improvement on the South 
African effort. I was a member of this Committee for years but we really got very 
little accomplished. It was mentioned at the Congress in London, last summer."

"We are willing to add this subject to the curriculum in veterinary medicine, but 
will have difficulty in getting it over, as a separate course, until such time as a recog-
nized nomenclature published in book form has been obtained. If the Bureau gets the 
money to establish vital statistics, maybe they will become the sparkplug that will 
get this thing under way."

"You will be interested to know that the staff of the School of Veterinary Medi-
cine, together with the State Livestock Sanitary Board Administrative Officers, are 
working hand in hand in an effort to secure from the practicing veterinarians and the 
veterinary medical students honest and complete reports of the various diseases of 
animals and poultry. Our State Livestock Sanitary Board has throughout the years 
endeavored to secure complete reports of the various infectious diseases involving 
animals. On looking over the accomplishments one would be led to believe, at least 
on first sight, that we have not made very much headway. However, we do believe 
that we are in a much better position in this respect than we were just a short time 
back."

"With reference to a course in the veterinary curriculum on vital statistics, it 
would undoubtedly fill a need. The curriculum at the present time is very full indeed. 
The information that would be gathered would be of tremendous value. Yet—al-
though I will concede that it is a step in the proper direction—it will also be a prob-
lem of proper administration to develop accurate diagnoses; and this, in my 
estimation, is the crux of the whole program, as the results obtained will of necessity 
reflect directly in proportion to the accuracy of the figures. You may rest assured 
that we, in the School of Veterinary Medicine, would consider favorably any program 
that might be instigated and in which we would anticipate moving forward in a sat-
isfactory and progressive manner."

"Contrary to general opinion, the School of Veterinary Medicine has for years 
attempted to teach some vital statistics as available, and the importance of record 
keeping and recording disease. Of course, we have been handicapped by lack of in-
formation and particularly organized information.

"We would certainly welcome vital statistic information from the United States
Livestock Sanitary Association and any other agency capable of supplying it. We have sufficient elasticity within the curriculum to present such data.

"We certainly will cooperate in attempting to bring to our student's attention the values that can be received from vital statistics, but until a central source of information is established, and until it can be demonstrated to the veterinarian that he will benefit, as well as the rest of the profession, I would question whether much cooperation would come from him."

The food and Agriculture Organization of United Nations is initiating programs concerned with Animal Health. At the suggestion of Dr. Harry Schoening, Chief, Pathological Division, U.S.B.A.I., the following statements concerning the International Office of Epizootics and the FAO are presented:

Following an outbreak of rinderpest in Europe in 1920, an International Conference to discuss the control of contagious diseases of animals was held in Paris in 1921. As a result of this conference, an International Convention for the establishment of the International Office of Epizootics was concluded at Paris in 1924. The office was not actually set up until 1927 by which time 29 countries had accepted the Convention of 1924.

OBJECTIVES

The principal objects of the Office are:
1. To collect and bring to the attention of governments facts concerning epizootic diseases and means of controlling them;
2. To stimulate and coordinate experimental or other research connected with the control of contagious diseases;
3. To prepare and encourage the conclusion of International agreements regarding control regulations, and to assist governments to enforce such regulations.

MEMBERSHIP

At the present time 42 countries or colonies are members of the Office. The United States of America is not a member nation.

STRUCTURE

The governing body of the Office is a Committee composed of one permanent representative of each member country. The Committee is required to meet at least once a year. The Committee selects, by secret ballot, the President and Vice-President of the Office to serve for a term of three years.

FINANCE

The Office is financed by prescribed contributions from member governments.

ACTIVITIES

The activities of the Office include notification of outbreaks of disease, periodical reports to governments and the publication of a monthly bulletin.

RELATIONSHIP TO THE FAO

The relationship to be established between the FAO and the International Office of Epizootics was discussed at the first meeting of the Sub-Committee on Animal
Health of the Standing Advisory Committee on Agriculture (March, 1947). The Sub-Committee recommended that an agreement should be concluded defining the scope of the respective activities of the two organizations. In pursuance of this recommendation, a Note of Understanding was drawn up in September, 1947.

As of this date the International Office of Epizootics has not joined the FAO and, while the United States is a member of the FAO, we are not as yet a member of the International Office of Epizootics.

In a report of the Food and Agricultural Organization of the United Nations, identified as C-50/3, July 20, 1950, a Conference of FAO, special session, Washington, D. C., was announced, to be held November 3, 1950: Title, “The International Plant Protection Convention and the World Reporting Service for Animal Diseases, Plant Diseases and Pests.” There appears under Section 3, reporting on animal diseases the following: “In accordance with the recommendation of the fifth session of the Conference, a special committee set up to consider this matter met in Paris at the office of the International Committee on Epizootics from the 1st to 5th of May, 1950.”

The bulk of the report concerns itself with the co-ordination and combining of efforts of the OIE (Office of International Epizootics) and concludes with the statement “It was appreciated that, if put into effect, this proposal would have the advantage of increasing rapidly and within the framework of the United Nations, the membership of the OIE by adding to it all member governments of FAO which as yet have not joined the OIE, thereby bringing about a worldwide organization and expanding and co-ordinating the present work of the OIE and the FAO. This would attain the objective of a unified veterinary organization, thus making available to all countries the deliberations and advice of a recognized authoritative group of veterinarians. Such an arrangement would result in giving an impetus to veterinary services in many countries with a resultant increase in food production.” This International organization will, obviously, be dependent on the U. S. Department of Agriculture for statistics from the United States.

The U. S. Department of Agriculture considers the collection and distribution of morbidity and mortality data to be a new program and not of sufficient importance to divert funds from an already reduced budget to the U.S.B.A.I. or other agency to initiate a program.

Our committee can help by encouraging and aiding the preparation and early printing of a “Manual on Nomenclature” by the American Veterinary Medical Association, which is now long overdue; and to arrange for the early printing of a “Manual on Diagnosis and Epidemiology” under the auspices of the U. S. Livestock Sanitary Association. We can secure the full cooperation of every State Veterinarian, and he, in turn, should secure the cooperation of the practitioner and other sources of information concerned with morbidity and mortality of livestock. The National assembling agency will obviously be dependent on the State Veterinarian and personnel within each state. The following resolutions are therefore proposed:

WHEREAS, initial reporting must start with the veterinary practitioner, public health officer and other professional people, and organizations at the county level; and
WHEREAS, these reports will be assembled in the office of the state veterinarian:

Therefore Be It Resolved that this Committee be authorized to approach state veterinarians and ask their early participation in a program of collecting and assembling animal morbidity and mortality data under their direction within that state.

WHEREAS the World Health Organization will be dependent upon a national agency as a source of morbidity and mortality data:

Therefore Be It Resolved that this Association continue to promote a national system of reporting morbidity and mortality among livestock and recommend that the Bureau of Animal Industry, U. S. Department of Agriculture be the agency and that the legislative committee be and is hereby instructed to support such legislation as may be necessary.

WHEREAS the U. S. Livestock Sanitary Association for many years has attempted to encourage the establishment of an office, bureau, or division of vital statistics concerned with morbidity and mortality of domestic animals; and

WHEREAS the United Nations World Health Organization has a great interest in and a working organization concerned with diagnosis of animal diseases and reporting:

Therefore Be It Resolved, that this Committee, representing the U. S. Livestock Sanitary Association, indicate to the United Nations, through the Food and Agricultural Organization, our endorsement of their program.
REPORT OF THE ADVISORY COMMITTEE ON ANAPLASMOSIS

L. T. Giltner, Washington, D. C., Chairman; Hubert Schmidt, College Station, Texas; Lee M. Roderick, Manhattan, Kansas; D. A. Sanders, Gainesville, Florida; R. S. Sugg, Auburn, Alabama; J. S. Campbell, Little Rock, Arkansas.

Anaplasmosis has now been reported from 30 states, this year Minnesota for the first time had a single outbreak in cattle brought into the State. The infection was positively diagnosed and to control further spread of the disease, the infected lot was sent to slaughter. Several years ago Ohio and Pennsylvania had similar experiences with one herd each which was disposed of by marketing for slaughter. All three States are now considered free from anaplasmosis, leaving still 27 infected States.

During the year reports have been received from many states where outbreaks have occurred occasioning slight to heavy losses. Indications are that the disease is continuing to spread from herds within the states and from carrier cattle brought into the states. Practicing veterinarians are making every effort to treat affected animals using both the older methods such as injections of blood from normal animals and the newer drugs and combinations of them. It is evident however from the results obtained that specific medication is not yet available, and this in spite of the excellent experimental work on drug therapy which has been done and is being prosecuted at the Kansas Station and the Oklahoma Veterinary Research Institute as well as by a number of other state institutions.

Some idea of the actual losses sustained by this disease may be gleaned from reports furnished by the Federal Meat Inspection Service. Condemnations of cattle sent to slaughter to official establishments were 429 in 1947, 429 in 1948, 541 in 1949, and 74 for the first 6 months of 1950. The last figure is considerably higher than the average for this period in the three preceding years (61). Presumably all of these cattle were in the convalescent stage when shipped to market since anaplasmosis was detected only at post-mortem examination. The convalescent period in anaplasmosis varies considerably in different cases but in general it is quite long from a number of weeks to months. It is quite likely that a very high per cent of the cattle condemned at the time of slaughter would have completely recovered if they had been cared for a longer period before shipping. At any rate these losses from condemnation very probably represent only a small part of losses that occurred from deaths in the affected herds on the farms and ranches where the outbreaks originated.

Some of the states where anaplasmosis occurs have spot maps of the counties where anaplasmosis has appeared. This year Dr. Muth prepared such a map for Oregon in which he indicates only scattered foci in 5 counties, 4 of which are in the southwestern part of the State. It is highly desirable that all infected states make available maps showing the distribution of the disease so far as is known at least by counties if not by premises.

In the field of research, Splitter (1) of Kansas State College recovered in pure form the blood parasite, Theileria mutans from the blood of an animal inoculated with blood from a known carrier of anaplasmosis. This is the first recording of this...
ANAPLASMOSIS

parasite in the United States and although it is commonly believed to be nonpathogenic, Neitz (2) has reported that under certain circumstances, as yet not fully understood, *Theileria mutosus* may cause severe symptoms followed by death. This agent may also serve to complicate experimental work on anaplasmosis, and investigators should be on the alert to detect its presence.

This year considerable interest has been shown by state and college officials in the work being done by the B.A.I. on complement fixation as a means of detecting carrier animals. A number of veterinarians and others have visited the Bureau laboratories to study techniques employed in the test and the procedure for production of antigen. Work already carried on in their laboratories has yielded encouraging results. In some states where anaplasmosis is limited in distribution, plans have already been suggested for cooperating with the Bureau in the use of the test as a possible means of control both in already infected herds and in detecting carriers introduced into the states. Although this is believed to be a step in the right direction, the Bureau feels that further experimental work similar to that reported in the Proceedings (3) of the 53rd meeting of this association should first be done.

REFERENCES

SPECIAL COMMITTEE ON COMMUNITY AUCTION SALES

H. G. GEYER, Columbus, Ohio, Chairman; JUSTIN CASH, Kansas City, Missouri; W. H. SHANNON, Boston, Massachusetts; C. M. HEFLIN, Baton Rouge, Louisiana; HARRY McDaniel, Jr., Dover, Delaware; E. P. ANDERSON, Lincoln, Nebraska; E. P. RYAN, Grand Island, Nebraska

Most of us are more or less familiar with the reports of previous committees covering the Community Sale or Livestock Auction Market. These reports have shown the development and growth of the Community Sale to its present status as one of the foremost cogs in the machinery of marketing livestock. They have also shown the need for legislation and regulations to control diseases in livestock as well as to regulate certain market practices connected with purchase and sale of livestock at these markets.

There are a number of states which have enacted legislation and promulgated regulations under authority of their law to control disease and regulate market practices. Some of these are basically good; others are inadequate. This committee is not attempting to write a so-called model Auction Market law. Rather we are incorporating in this report the basic features from laws that appear to have covered the matter in a satisfactory manner.

In view of this, your committee submits the following and recommends that this Association appoint a special committee to draft from this report a so-called model Auction Market law.

WHAT THE LAW SHOULD CONTAIN

Definitions of words and phrases are necessary in any law. The administration of the law should be under the Department of Agriculture, the Commissioner of Agriculture, the Livestock Sanitary Board or Commission. Therefore, the definition would be as follows, using the word or phrase applicable:

1. The word “department” as used in this act shall mean the Department of Agriculture.

2. The word “animals” or “livestock” as used in this act, shall mean and include cattle, calves, sheep, goats, swine, horses, mules and poultry.

3. The word “person” as used in this act shall mean and include any person, association, co-partnership or corporation.

4. The word “dealer” or “broker” as used in this act shall mean any person engaged in the business of buying, receiving, selling, exchanging, negotiating or soliciting sale, resale, exchange or transfer of any animals, but shall not be construed to include:

   (a) any railroad transporting animals either inter or intra-state,
   (b) any person who is permanently discontinuing the business of farming, dairying, breeding, raising or feeding animals,
   (c) any person who sells livestock which has been raised on the premises of such person,
   (d) any butcher, packer or processor who receives animals exclusively for immediate slaughter,
COMMUNITY AUCTION SALES

(e) terminal livestock markets operating under the control of the Bureau of Animal Industry of the United States Department of Agriculture.

Since the definition of a dealer or broker as set forth above is broad and inclusive so as to include operators of Community Sales as well as operators of concentration yards and the ordinary dealer, we feel that it is not necessary to define Community Auction Sale.

5. The term "agent" as used in this act shall mean any person buying, receiving or soliciting the sale, resale, exchange or transfer of animals for or on behalf of any dealer or broker.

6. No person shall act as a dealer or broker without first being licensed to do so as provided in this act. No agent shall act for any dealer or broker unless such dealer or broker is duly licensed, has designated such agent to act in his behalf and has notified the department in his application for license, or given official notice in writing of the appointment of such agent and requested the department to issue to such agent an agent's license. Such dealer or broker shall be accountable and responsible for contracts made by said agents.

APPLICATION FOR LICENSE

Application for a dealer or brokers license should be made in writing on forms furnished by the department. Before the license is issued the applicant should satisfy the department of his character and good faith in seeking to engage in such business. He should also furnish proof of his financial responsibility, a certificate of scale test showing the weighing facilities to have been found in a satisfactory condition and a certificate of inspection showing that the livestock market facilities are adequate and are and can be maintained in a satisfactory sanitary condition.

Proof of financial responsibility is to be shown by filing a surety bond in an amount commensurate with the amount of business transacted or depositing negotiable bond or bonds. The license should be an annual one expiring December 31 and should not be issued until the applicant has met the above requirements.

THE BOND

The bond should be in a form prescribed by and to the satisfaction of the Department, Commission or Board, as the case may be. It should be of a surety company authorized to do business in the state or with individual sureties owning unencumbered real estate within the state and worth, above all exemption, double the amount of bond and conditioned for the payment of a judgment or judgments against the applicant furnishing the bond and arising out of the failure of such applicant to conduct his business in accordance with the requirements of the law or for non-payment of obligations in connection with the purchase and sale of animals. In some states it would be unconstitutional to demand a bond with corporate surety, hence the alternative for individual sureties.

DEPOSIT OF NEGOTIABLE BONDS

Provision should be made in the law for depositing negotiable bonds of the United States of America, the state or a political subdivision of the state in lieu of filing a surety bond. This to be made under a deposit agreement form prescribed by the
Department, Board or Commission. All such bonds or deposit agreements should contain a provision requiring that at least ten days prior written notice be given the Department, Board or Commission by the party terminating such bonds or deposits in order to effect termination. The law should contain a provision to increase or decrease the amount of bond or deposit required, dependent on the amount of business transacted.

**Defaults Under Bond or Deposit**

The law should contain a provision for any person damaged by any violation of the law, or defrauded by the dealer or broker, to maintain an action at law against such dealer or broker and the surety or sureties on the bonds, or for the application of the deposit. Claims against the dealer or broker should be invalidated unless filed within ninety days from the date of the alleged violations.

**License Fees**

Fees for dealers or brokers licenses should be paid annually, on a sliding scale based on the number of head of livestock handled through each Market during the preceding calendar year.

There should be a flat fee charged for Agents and Weighers licenses.

**Livestock Rotary Fund**

All fees collected for licenses should be paid into the state Treasury and credited to a fund known as the "Department of Agriculture's Livestock Rotary Fund." Such fund to be used by the Department to carry out the purpose and provisions of the law. Payment of obligations to be made from this fund upon warrant of the State Auditor.

**Revocation or Refusal to Grant a License**

The Department should be given authority under the law to revoke or refuse to grant a license after due hearing for the following reasons:

(a) Where the applicant or licensee has violated the laws of the state or official regulations governing the inter or intra-state movement of animals.

(b) Where there have been false or misleading statements as to the health or physical condition of the animal or animals with regard to official tests or quantity of animals, or the practice of fraud or misrepresentation in connection therewith.

(c) Where there has been a continual course of dealings of such nature as to satisfy the Department of the inability or unwillingness of the licensee to properly conduct the business of the dealer or broker.

(d) Where the licensee engages in buying or receiving animals, or receiving, selling, exchanging, soliciting or negotiating the sale, resale or exchange of animals known to be diseased or known to have been exposed to communicable diseases likely to be transmitted to other animals or human beings.

(e) Where the licensee fails to practice measures of sanitation, disinfection and inspection of premises or vehicles used for the stabiling, yarding, housing, holding or transporting of animals.
(f) Where there has been a continual or persistent failure to keep records or to produce records of transactions.

(g) Where the licensee fails to maintain and operate weighing facilities in a suitable and satisfactory weighing condition.

(h) Where the licensee fails to maintain a bond or deposit.

WEIGHERS LICENSES

An application for a weigher's license should be required and should contain the applicant's name and address, the name of the market where he is to weigh and his previous experience as a weigher. There should be a penalty under the law if a weigher gives a false certificate of weight or for accepting, directly or indirectly, money or other consideration. There should be a fee charged for the license, which should expire at the end of each year.

AGENTS LICENSES

The market operator should designate, in his application for a license as a dealer or broker, the names of the persons to act as agents in his behalf or give official notice in writing of the appointment of said agents and request that licenses be issued on their behalf. A fee should be charged for such license, which should expire at the end of each year.

TESTING OF SCALES

Scales should be tested once every six months under supervision of the Department or an agency approved by the Department.

VETERINARY INSPECTION

The law should provide for the inspection of all yards, pens, premises and vehicles in which animals are quartered, fed, held or transported, by a veterinarian approved by the Department. Such yards, pens and premises should be thoroughly cleaned and disinfected under the supervision of the veterinarian when prescribed by the Department. This provision of the law should be implemented by a regulation setting forth the manner of cleaning and disinfection, when to disinfect, the kind of disinfectants permissible and the disposition of litter and manure. There should also be a provision requiring an inspection and treatments when found necessary to prevent the spread of diseases of animals sold, resold, exchanged or transferred from pens, yards, premises or vehicles by brokers or dealers, when such animals are sold for purposes other than immediate slaughter. Such inspection and treatments should be made by an approved veterinarian. Fees for such inspection and treatments are to be collected from consignor and paid by the dealer or broker and a certificate of inspection is issued to the purchaser by the inspecting veterinarian. This section of the law should not apply to any person operating a slaughtering establishment or establishments at which ante-mortem veterinary inspection is regularly maintained by the Bureau of Animal Industry, United States Department of Agriculture. Vehicles transporting livestock will be inspected by an approved
veterinarian when deemed necessary to prevent the spread of diseases and fees for such inspection and treatment will be paid by the owner of such vehicles.

Law should provide that no livestock shall be offered for sale or be transported or offered for transportation by owner of said livestock known to be diseased or known to have been exposed to communicable diseases likely to be transmitted to other animals or human beings, without first having a permit to do so from proper authorities.

**AUTHORITY TO MAKE REGULATIONS**

Authority should be given the Department to formulate, adopt promulgate and enforce regulations.

**AUTHORITY TO ENTER COMMUNITY SALE**

Authority should be given any duly authorized representative of the Department to enter any Auction Market or Community Sale for the purpose of inspecting the facilities and livestock and to make examinations or apply tests as deemed necessary.

**AUTHORITY TO INSPECT RECORDS**

Authority should be given any duly authorized agent to inspect the records of any licensee at any time to determine the origin and destination of any livestock handled by the licensee and to determine if any of the provisions of the law or the rules and regulations promulgated thereunder, have been violated.

**PENALTY**

There should be a penalty for violation of the law or any of the rules and regulations promulgated thereunder.

**RULES AND REGULATIONS**

Regulations should be adopted by the Department, Board, or Commission, as the case may be, to implement the law and cover sanitation, cleaning, and disinfection, construction and maintenance of buildings, pens, chutes, docks, etc. and the setting aside of pens to receive animals which are to be tested, vaccinated or dipped and quarantine pens for the handling of reactor cattle.
EFFECT OF PARASITES ON SWINE PRODUCTION

LLOYD A. SPINDLER, B.S., M.S., Sc.D.

Zoological Division, Bureau Of Animal Industry, Agricultural Research Administration, United States Department of Agriculture

Swine harbor many species of worm and protozoan parasites, the infective stages of which are concentrated in places frequented by hogs, namely, permanent lots and pastures. As a consequence, beginning at birth and continuing throughout life, pigs kept in such places are subject to impact of repeated parasitic infections which can permanently injure their health or even cause their death. The effect of sublethal infections may not become apparent, however, for some time and in many cases may not be recognized at all. Generally, all or nearly all of the pigs in a herd are likely to be parasitized. Unlike bacterial and virus diseases which often occur in violent outbreaks, parasitic infestations in swine are usually of a less conspicuous nature. Investigators agree, however, that losses occasioned by parasites constitute a limiting factor in the economy of swine production and have classified these losses into two main categories. One relates to losses which accrue directly to the farmer as a result of deaths from gross parasitism and the more insidious losses resulting from retarded growth and increased amounts of feed necessary to bring the parasitized animal to market size. The other category involves losses which accrue indirectly to the farmer as a result of lowered market prices which have their origin in expected condemnations under meat inspection procedures of edible portions of carcasses because of the presence of parasites and associated lesions.

In spite of these well-recognized losses, some hog raisers often take little note of parasites and apparently fail to recognize their importance. This indifference may stem in part from the fact that, in the past, there has been available relatively little precise information as to the magnitude of losses which the raiser of swine may sustain as a result of damage inflicted by parasites. It is the purpose of this paper to summarize briefly some of the information of this nature that has been slowly accumulating during the last few years. For purposes of illustrating certain of the facts set forth, it is considered desirable to review very briefly the experiments from which the facts were gleaned. Examples of the direct type of losses will be considered first.

DIRECT LOSSES

In recent investigations of the effect of parasites on the growth of pigs, groups of weanling littermate pigs were kept on permanent hog lots heavily contaminated with infective stages of the majority of the parasites that infect swine. Certain of the pigs were kept relatively free of parasites by feeding skim milk in lieu of grain once daily. Others were kept free of parasites by feeding milk in lieu of grain for periods of 3 consecutive days at intervals of 2 weeks. Others were fed only a balanced grain ration and being unprotected, therefore, against parasites, served as controls. Observations were continued for a period of about 3 months. During the experiments the pigs that were protected against the acquisition of parasites by skim milk gained...
83 pounds on the average, whereas the unprotected pigs acquired many parasites and as a consequence, gained an average of only 31 pounds. The unthrifty condition of the animals that were heavily parasitized was reflected in an inferior condition of the carcasses at slaughter, characterized chiefly by small size and lack of fat.

In the investigation just summarized it was not possible to compare the amounts of grain consumed by the pigs. In investigations recently carried out by parasitologists of the Bureau of Animal Industry in Georgia, pigs farrowed under conditions where moderate infestations of parasites were acquired, consumed an average of at least 0.8 pound more feed per pound of weight gained than did comparable pigs having either no worms or only a few. In addition, the more heavily parasitized pigs required at least 5 weeks longer to reach market weight than did the ones only slightly infested.

In the light of the demonstrated effect of parasites on the growth and feed consumption of pigs, it becomes important to evaluate the effect on the host of individual species. The following brief discussion will be concerned with worm parasites only since the effect of most protozoan infections on the growth of pigs is, as yet, not well understood. Only a few representative species of worms will be considered.

The large intestinal roundworm, or ascarid, which occurs in the small intestine, is the parasite that is most widely known to hog raisers. It is the largest and perhaps the most widespread of the parasites of swine. It is a rare occurrence, indeed, to find a farm-raised pig that does not harbor at least a few ascarids and it has been estimated that about one-third of the breeding stock is infested. Examinations of the general run of hogs slaughtered in meat packing establishments in different parts of the country revealed that as many as 70 per cent harbored ascarids. Due to the prevalence of this parasite and the fact that a single female may lay as many as 250,000 eggs a day, the soil of most hog lots and pastures is teeming with the eggs which serve to insure infection of pigs kept thereon.

Ascarids of swine go through a highly complicated life cycle within the body of the pig. The infective eggs, when swallowed by susceptible pigs, hatch in the intestine and the microscopic young worms penetrate the blood vessels and are carried to the liver and from there to the lungs. In the lungs the larvae break out of the capillaries into the air spaces through which they migrate to the esophagus and are swallowed. Upon reaching the small intestine they become established and grow to maturity in about 6 weeks. During their migration through the liver and lungs the young worms cause extensive damage to these organs, the process of repair in the liver resulting in the formation of white scars beneath the capsule and in the parenchyma. Some investigators have considered that unthriftiness commonly associated with ascarid infections is the result of injuries inflicted by the larvae during their migration through the liver and lungs and that the adult worms are of comparatively little importance. This idea had its inception, no doubt, in the fact that clinical manifestations of an invasion of the lungs by large numbers of ascarid larvae are sometimes spectacular and easily recognized and that adult swine often harbor ascarids in the intestine without apparent ill effects.

That adult ascarids also depress the growth of pigs is shown by the following facts. Four groups of worm-free pigs, littermates, were housed separately at weaning
under conditions which precluded extraneous infections of parasites. One pig of each group was fed infective ascarid eggs daily between the 14th to the 25th and the 32nd to the 38th days; the remaining pig of each group was not fed eggs and served, therefore, as a control. The pigs were kept under observation for about 4 months. They were then given a final weighing, slaughtered and examined for parasites. The observations showed that the total weight gained during the experiment by each of the infected pigs was inversely proportionate to the number of ascarids harbored at necropsy, the most lightly infected pigs making the greatest total gains. For example, one pig, at necropsy, harbored 12 ascarids and had gained 92 pounds during the test. This gain was not materially different from that of the uninfected control pig, which gained 94 pounds. At the termination of the experiment, there was little difference in the appearance of the two pigs. This, coupled with the fact they differed only slightly in weight, would seem to indicate that the 12 worms harbored by the test pig had exerted very little effect on its growth. Shortly after the first feeding of ascarid eggs, however, the pig receiving them lost weight, which it did not regain until after 2 months had elapsed. In time, the pig apparently overcame the drag of the ascarids harbored and began to gain weight rapidly.

Another of the infected pigs which harbored 20 ascarids at necropsy gained only 60 pounds during the test, whereas the unparasitized control, not being hampered by worms, gained 109 pounds. As in the case of the pig previously discussed, the one that harbored 12 ascarids, a sudden loss of weight occurred shortly after the first administration of ascarid eggs. From that time until about the 70th day of the test, the growth rate of the parasitized pig was not materially different from that of the unparasitized one. From then on, however, there was an increasing difference in the growth rates of the two pigs and at slaughter their weights differed by 49 pounds.

A third one of the infested pigs which harbored 39 ascarids gained only 49 pounds during the test, whereas its uninfected control gained 103 pounds. During the experiment, the pattern of growth followed by the infected pig was similar to that of the two pigs already discussed, namely, an initial loss of weight shortly after the first administration of ascarid eggs, followed by a period during which the control gained weight more rapidly than did the wormy pig. The difference in weight of the two pigs at slaughter was 54 pounds.

The fourth one of the infected pigs harbored 109 ascarids at necropsy and weighed 8 pounds less than at the beginning of the test; the companion pig which was free of worms gained 96 pounds during the test.

Analysis of the growth rates of the pigs in relation to the periods during which eggs were fed and the probable rates of development of the worms shows the following facts: (1) During the period of invasion of the liver and lungs of the host by the migrating ascarid larvae, rather marked reductions in the growth rate of the individual animals occurred; (2) during the stage of growth and development of the worms the growth rates of the infected pigs were approximately equal to those of the corresponding control pigs, indicating that little deleterious effect was being exercised by the developing worms; and (3) beginning at approximately the time when ascarid eggs first appeared in the feces of the test pigs a rather marked
slowing down of the growth rate of the parasitized animals occurred, except in the case of the pig found to harbor the small number of only 12 ascarids. This slowing down of the growth rate, coincident with attainment of sexual maturity by the worms, indicates that an adverse effect on the health of the pig was being exerted by the mature worms. These findings show that the condition of unthriftiness commonly associated with ascarid infestations in pigs is a result not only of damage produced by the migrating larvae, but by that of the adult worms in the intestine.

Another parasite apparently highly pathogenic to pigs, but relatively unknown, except to parasitologists, is the intestinal thread worm known as Strongyloides ransomi. Adult threadworms, all of which are females, live in the small intestine. Eggs produced by the worms in the intestine are eliminated with the feces and develop and hatch on the soil. Infections of threadworms can be acquired by pigs as a result of eating feed contaminated with the infective larvae. Pigs can also become infected by the penetration of larvae through the skin. Once within the body of the pig the young threadworms invade all tissues including the heart muscle, the brain, the spinal cord, the skeletal muscles and the reproductive organs. Eventually the larvae reach the lungs and migrate through the air passages to the esophagus and are swallowed. In the small intestine they grow to maturity in about a week.

Recent investigations showed that this worm, so small that it is commonly overlooked in routine post mortem examinations, can exert a profound injurious effect on the health of pigs and is a cause of sudden death of adult as well as of young swine. In certain foreign countries this worm has come to be recognized as a cause of epizootics among pigs. Field investigations to ascertain the proportion of pig mortality that can be attributed to threadworms have not been carried out in this country. Investigations have shown, however, that in sublethal experimental infections the rate of growth of infected pigs may be less than one-half that of pigs free of the parasites. Numerous cases of sudden death of adult swine in the herd of the Zoological Division at Beltsville, Maryland and a number of deaths of farm-raised pigs in Maryland have been found associated with extensive invasion of the entire body, particularly the heart muscle, by the migrating larvae.

**INDIRECT LOSSES**

The foregoing are examples of losses that can accrue directly to the swine raiser as a result of infection of pigs by parasites. The following are examples of the indirect type of losses which occur from time to time. For many years it has been known that adult ascarids sometimes migrate into the common bile duct and even make their way into the liver. The worms in the bile ducts obstruct the flow of bile which, as a consequence there of, is distributed throughout the flesh and fat, giving rise to a generalized icterus. This necessitates condemnation of a large proportion of the carcasses so affected. Recently it was found that occlusion of the bile ducts of swine by migrating ascarids is of frequent occurrence. In one year alone as many as 8 per cent of swine carcasses condemned for all causes under Federal meat inspection in the United States were condemned because of icterus associated with the presence of ascarids in the bile ducts and liver. In one meat packing establishment alone, condemnations for this cause have at times amounted to 50 to 75 per cent of condemnations for all causes.
As stated previously, larval ascarids during their migration through the liver produce damage to that organ, the resulting scars necessitating extensive trimming or even condemnation of the liver in toto. Observations by parasitologists of the Bureau of Animal Industry in meat packing establishments have disclosed that as many as 50 per cent of the livers of the general run of hogs slaughtered contained lesions caused by ascarids.

Another parasite that causes economic losses through condemnation of edible parts of carcasses is the kidneyworm. Adult kidneyworms occur in cysts along the ureters, in the kidney proper and in the kidney fat. The adult females in the kidneys and ureters produce eggs which are discharged to the outside with the urine. Under favorable conditions the eggs hatch in a day or two and the young worms, the larvae survive for several weeks. Pigs kept on contaminated ground become infected by swallowing the larvae along with feed or water or as a result of penetration of the larvae through their skin. Regardless of the path of entry into the bodies of pigs, the larvae get into the blood stream and are carried to the liver, lungs and other internal organs. In the liver, the young worms ultimately bore through the walls of the blood vessels and wander throughout liver tissue proper and finally perforate the capsule. The worms then continue their migrations in the abdominal cavity. The majority ultimately reach the kidney fat and kidneys, which they penetrate. In many cases the wandering worms invade the loin muscles and other organs and tissues. In the liver large white scars result, making the tissue unfit for food. Entire carcasses are frequently condemned because of the presence of kidneyworms in the skeletal muscles. Kidneyworms were formerly thought to be confined to swine in the South, but it has recently been found that this parasite has become established in the Corn Belt. Recent surveys conducted by parasitologists of the Bureau of Animal Industry revealed that from 20 to 40 per cent of the livers of the general run of Corn Belt hogs coming to slaughter in meat packing establishments contained damage inflicted by kidneyworms. Investigations of the extent of losses due to this parasite in the South revealed that about 90 per cent of the livers of the general run of hogs slaughtered are condemned because of lesions caused by kidneyworms. In addition, Federal meat inspection records show that in certain meat packing establishments condemnations of hog carcasses because of pyemia due to generalized infections of kidneyworms are at times as great as 10 per cent of condemnations for all causes.

DISCUSSION

The foregoing is a brief summary of the nature and extent of losses caused by only a few species of the parasites that infect swine. Numerous other species also occur customarily in these host animals. Among the parasites not mentioned are lungworms, stomach worms, whipworms, nodular worms and others. Although quantitative evidence of the extent to which these worms can damage the health of the pig is lacking in some cases, all of these parasites should be considered potentially injurious. Evidence favoring this view is gradually coming to light.

In the present state of our knowledge it is not possible to determine accurately the cost of swine parasites for the country as a whole. Some estimates have been made, however. For example, in 1947 losses attributable to swine parasites from
condemnations of edible portions of carcasses alone were estimated to be 50 cents or more per hundred pounds of live weight. The average weight of hogs marketed is about 250 pounds. Since unparasitized hogs are a rarity, the cost of parasites may be tentatively considered as approximately $1.25 per animal marketed. Agricultural Statistics for 1949 show that the number of hogs slaughtered under Federal meat inspection in the United States in 1948 was about 60 million. On that basis the cost of swine parasites to the farmer during that year may be estimated to have been in excess of 75 million dollars. That is a huge tribute to pay to pests which can be at least partly controlled.
ERADICATION OF SHEEP SCABIES

H. E. Kemper, D.V.M., AND I. H. Roberts, D.V.M., B.S.*

Zoological Division, Bureau of Animal Industry, United States Department of Agriculture

WHAT SCABIES IS

Among the most destructive and persistent diseases of sheep is scab, or scabies—a serious inflammation of the skin caused by minute external parasites known as mites. The condition is the direct result of the piercing of the skin by the sharp mouth parts of the mites; the parasites derive nourishment from serum that flows from the punctures. The mites are believed to introduce a poisonous secretion into the wound. Each puncture results in a small pustule or blister. As the mites multiply and more wounds are made in the skin, there is increased itching, inflammation, and exudation of serum. This serum, mixed with dead skin and particles of dirt, soon hardens and the result is the formation of a heavy crust or scab from which the disease derives its name. When mites are first introduced onto the skin of an animal, only a small, bluish-red, inflamed, moist area can be seen. As the mites multiply, they seek the healthier parts around the edges of the diseased area, and the lesion enlarges. The skin becomes very hardened and thickened, the wool falls out, and irritation is usually intense. Sheep suffer a great deal as a result of the inflammation and the irritation, and the condition occasionally becomes severe enough to terminate in death.

THE MITES WHICH CAUSE SCABIES

The parasite with which we are primarily concerned is known as Psoroptes equi var. ovis, and the disease which it produces is called common or psoroptic sheep scab. The mites are pearly-white and are barely visible to the unaided eye. Their entire life cycle is passed on the body of the host. Each female may deposit from 15 to 24 eggs, which usually hatch after four to seven days of incubation. The young mites reach maturity and mate, and the females deposit eggs when approximately 10 to 12 days of age. This process is repeated until a large part of the body surface is literally covered with larval and adult mites. This disease is highly contagious, and is easily transmitted from animal to animal. The mites crawl from infested sheep to clean sheep until practically the whole flock is diseased. The spread of the infestation from flock to flock may occur even as a result of the most casual contact.

IMPORTANCE OF SHEEP SCABIES

Scab is an old disease, and sheepmen have been acquainted with it since shepherds first tended their flocks on the plains of central Asia. In the United States about 50 years ago, the disease was the greatest drawback to the sheep industry in the western states, and it caused heavy losses to feeders. Many ranchers and farmers

*Albuquerque, New Mexico
H. E. KEMPER AND I. H. ROBERTS

refrained from engaging in the sheep business and feeders refused to buy undipped range sheep. So prevalent was the disease that in 1896, England prohibited the importation of live sheep from the United States. The U. S. Department of Agriculture, in cooperation with the states, has been actively engaged in combating scabies for over 50 years. Millions of dollars have been spent in the control of the disease, particularly in the Rocky Mountain States. Two parasiticidal agents were available, the use of which has survived to this very day. These are lime-sulphur and nicotine-sulphate solutions. With rigid quarantine and dipping procedures, which involved accurate testing of the contents of dipping vats, heating the dipping solutions, double dippings at 10— to 14-day intervals and other precautions, much has been done to lighten the economic burden imposed by scabies. In fact, in the Southwest, the disease has been almost entirely eliminated after many years of costly enterprise.

Scabies is now more prevalent in the states east of the Mississippi than elsewhere in the country. There still exists, in every state, the need for extreme vigilance to prevent the reintroduction and spread of scab. In practically every state in the Union, Federal and state inspectors are employed to prevent the introduction of infestation and to prevent the dissemination of the parasite, if it should gain entrance. Nearly every state is currently engaged either in controlling scab to a greater or lesser degree, or in maintaining a rigid quarantine against it. The cost of this action and vigilance is considerable. Despite this expenditure of time, manpower and money, we still find scabies when we least expect it. Only last year it was necessary to quarantine and treat over 10,000 sheep in New Mexico, a state which has long been proud of its complete freedom from scabies. Several thousand infested and exposed sheep were treated in Montana, Idaho, Colorado, South Dakota and elsewhere in the summer and fall of 1950. These states, too, had been scab-free for several years.

OLD AND NEW TREATMENTS FOR SCABIES

The lime-sulphur and nicotine-sulphate solutions are at present the only recognized dips for official use on scab-infested or exposed sheep intended for interstate movement. Both dips are undeniably effective, but require at least two or more dippings at 10-to 14-day intervals to effect eradication. They destroy the existing mites but have no ovicidal properties and have only limited residual effectiveness. The first dipping kills the existing mites and the second one destroys those hatching from the eggs on the skin. In spite of certain shortcomings of these dips, their effectiveness is attested to by the fact that scabies has been eradicated from millions of sheep and large areas of the west have been rid of the disease through the use of these materials. Practical field or vat-side tests are available to determine the concentration of the ingredients in the dip at all times during dipping operations.

The development of one of the new chlorinated hydrocarbons, benzene hexachloride (commonly referred to as BHC), opened a new field of research for scabies control. With the reappearance of sheep scabies in several western states, this new, promising acaricide was tested as a single treatment in an unheated dip for the eradication of this troublesome parasitic infestation.

Toxicity tests were first made at the Zoological Division laboratory at Alburquer-
ERADICATION OF SHEEP RABIES

que, New Mexico, using the wettable 50 per cent BHC of 13 per cent gamma isomer. Concentrations of 0.065, 0.13, 0.195, and 0.26 per cent of the gamma isomer, respectively, were used. The highest concentration tested was four times as great as that presently recommended for scabies eradication. No clinical evidence of any toxicity to the sheep was observed. Wool samples from sheep dipped in BHC suspensions were submitted to the Southwestern Range and Sheep Breeding Laboratory at Fort Wingate, New Mexico. No discoloration or weakening of wool fibers, nor any interference with the scouring or dyeing of those wool samples were reported.

TESTS IN LOUISIANA

Initial field tests, employing BHC dips for the treatment of scabies (2), were conducted in the fall of 1947 in southwestern Louisiana. Three flocks of sheep were dipped in aqueous suspensions of 50 per cent wettable BHC, containing, respectively, gamma isomer concentrations of 0.033, 0.06, and 0.09 per cent. All animals were dipped once and held in the swim for 2 minutes. From five to 10 heavily infested animals were chosen from each of these flocks. They were paint-branded and were used later in determining the effectiveness of the dips. The paint-branded animals, after being dipped, were segregated in small traps or fenced pastures and were painstakingly examined at frequent intervals for a period of 42 days. No live mites were found 24 hours after treatment and at no time during a subsequent period of 42 days. With the destruction of all mites, healing of lesions progressed rapidly. Incipient lesions showed evidence of beginning to heal within two to three days. Serum crusts, otherwise slightly moist, began drying to hardened crusts. Small, acute lesions healed within three weeks and disappeared completely within about one month. Extensive and thickened crusts, especially over chronic lesions, began separating from the skin within three weeks after destruction of all mites. The skin under the crusts became progressively softer, more pliable and later oily. As the lesions healed, the normal wool growth usually raised the dried serum crusts and the growing wool carried with it small crusts or flakes of epidermal scales. The skin at the site of scabies lesions returned to a normal healthy color and texture. No systemic disturbance or skin irritation was evidenced at any time following treatment. The fleeces of the dipped sheep retained the typical musty odor of BHC for the duration of these tests. Incidentally, the disagreeable odor of the chemical appeared to act as a fly repellent.

In addition to the three small experimental flocks dipped in BHC, 4,500 head of a large flock were dipped in a suspension containing 0.06 per cent gamma isomer. The 4,500 head in this group represented about 95 per cent of the flock. The remaining 5 per cent could not be gathered from the dense forests and swamps. After dipping, the sheep were immediately returned to the plantation for winter grazing. An examination of the flock 5½ months later showed that despite continuous association with other undipped, scabies-infested sheep, the dipped sheep were free of scabies except for a very few individuals, which showed only incipient lesions. The indications were that the BHC treatment had apparently protected the flock from reinestation for about three to four months.

In the spring of 1948 tests were continued in Louisiana to determine the minimum effective concentration of gamma isomer of BHC required to destroy psoroptic
scabies mites (3) and to compare the values of all-isomer BHC and the then newly prepared pure gamma isomer product, which is essentially odorless. The sheep were in full fleece and bearing exceptionally heavy infestations of mites and presented, moreover, a startling picture of clinical mange, showing both active and chronic lesions.

Gamma isomer concentrations employed ranged from 0.0075 per cent up to 0.06 per cent. A dip containing 0.0075 per cent gamma isomer destroyed all mites on a ram in less than 44 hours; 0.015 per cent destroyed all mites on one ram in two hours and 45 minutes; while 0.03 per cent destroyed all mites in less than two hours. These concentrations were, of course, only experimental and not considered practical for effective field use.

In the tests conducted to evaluate the pure gamma isomer against the all-isomer product, concentrations of 0.03 per cent and 0.06 per cent gamma isomer of each material were employed. Heavy infestations of Psoroptes equi var. ovis were eradicated by a single dipping in unheated aqueous suspensions at both 0.03 and 0.06 per cent gamma isomer concentrations and the products were determined to be equally effective scaricides. The high gamma isomer preparations, however, seemed to have the distinct advantage over the all-isomer BHC product in that they were virtually odorless. On the other hand, sheep dipped in the same concentrations of the all-isomer product were readily identified by the musty odor in their fleeces six weeks after treatment. The relative absence of odor following the use of the nearly pure gamma dip is a matter deserving of comment, in view of the possible transfer of odor from fleece to carcass.

TESTS IN VIRGINIA

Additional tests conducted in Virginia during June and July 1948 on recently shorn sheep (4) indicated that concentrations of 0.015 and of 0.03 per cent gamma isomer were effective under controlled conditions. Despite this, dips containing not less than 0.06 per cent gamma isomer were recommended and used there, for the most part, in connection with psoroptic scabies eradication programs on farms and elsewhere. It is dangerous to dip sheep in lime-sulphur or BHC dipping preparations, if there are any fresh wounds on the animals. In dipping shorn sheep in Virginia, a period of at least ten days was allowed to elapse between shearing and dipping to allow shear cuts to heal.

TESTS IN NEW MEXICO

In 1949 some scabies-infested sheep were imported into New Mexico. This resulted in parasitizing and in exposing to scabies some 5,000 head of sheep. Dr. F. L. Schneider, State Veterinarian of New Mexico, granted permission to dip 3,000 head of sheep, comprising three flocks, in BHC. Two flocks were infested and one flock was classed as exposed. These 3,000 head were dipped in unheated water suspensions of 50 per cent wettable BHC powder containing 6 per cent gamma isomer. The calculated gamma isomer concentration of the prepared dip was 0.06 per cent. Following dipping, these sheep were confined to fenced pastures near Carlsbad, New Mexico and monthly examinations were made for ten months. No recurrence of scabies was observed in any of these flocks.
BHC was used in dipping 2,000 additional infested sheep near Clovis and Ocate, New Mexico. These sheep likewise were dipped only once in the same gamma isomer concentration. They have been repeatedly inspected for eight months following dipping and no scabies infestation has recurred in these flocks. In view of the lapse of time since they were dipped, and the repeated inspections, it may safely be said that eradication of sheep scab has been achieved in these 5,000 or more sheep with a single dipping in unheated water, at temperatures ranging from 60° to 85° F., by using wettable BHC at a concentration of 0.06 per cent gamma isomer. At no time has any indication of toxicity been observed as a result of these BHC dippings. Very young lambs were allowed to swim through the vat without being detained and tiny lambs were hand-dipped in a barrel to avoid possible losses by drowning.

ADVANTAGES AND DISADVANTAGES OF BHC DIPS

One disadvantage in the use of wettable BHC powder is the fact that it is insoluble in water. When the dip is not kept constantly agitated by the sheep going through it, or by mechanical means, it settles to the bottom of the vat. This insoluble or so-called wettable material is apparently taken up in the fleeces in slightly greater proportions than that suspended in the water initially. Therefore, in dipping several thousand sheep in a vat, the proportion of wettable material must be increased when replenishing the vat contents, to remove the possibility of reduction of the effective strength of the dip.

Unfortunately, there is no practical vat-side field test to determine the strength of the material in the vat at all times, as is available in the officially recognized lime-sulphur and nicotine dips. Therefore, the lime-sulphur and nicotine dips are the only two preparations recognized for official dipping of sheep infested with or exposed to scabies which are intended for interstate movement.

In view of the fact that the BHC dip can be used unheated and as a single treatment and that it consistently eradicated infestations of scabies in both small and large experimental field tests, state authorities would be justified in employing this material to conduct some further experimental dippings in their states to obtain first-hand information.

A paper by W. Downing (1) reported a protective period against scabies infestations of from eight to 12 weeks following a single dipping in 0.1 per cent all-isomer BHC suspensions, calculated to contain 0.0125 per cent gamma isomer. The method employed by Downing in these experiments was the establishment of cross infestation of scab mites by mixing clean, dipped sheep with infested sheep and further supplemented by transplanting ovigerous females from the infested sheep to the clean, dipped sheep. This process was repeated every 14 days after dipping until infestation was established.

A parallel experiment was conducted at the Zoological Division laboratory in Albuquerque, New Mexico, to determine the protective period against scabies infestation of sheep when dipped in BHC suspensions containing 0.06 per cent gamma isomer. In this experiment the dipped sheep were exposed to scabies-infested sheep in small pens. The concentration of the dip used was approximately five times as great as that used in England by Downing. A protective period of five months was established in this experiment, as compared to three months by Downing.
Benzene hexachloride should be used against sheep scabies in a quantity to provide 0.06 per cent gamma isomer. It is interesting to note, however, that the minimum effective gamma isomer concentration is 0.0075 per cent; this concentration required at least 36 hours to destroy all adult mites. At a concentration of 0.015 per cent, only two hours and 45 minutes was required to destroy all adult larval mites. Two hours was required to destroy the mites at 0.03 per cent and at 0.06 per cent. The use of 0.06 per cent is recommended, in general scab control operations on farms and ranches. Under ideal conditions of a controlled experiment, naturally, the minimum lethal quantity of an acaricide or insecticide may prove effective repeatedly. On the farm, however, under ordinary working conditions, the reverse is frequently the case. The capacities of large vats are often underestimated. The fleeces of sheep are thought to have a tendency to screen out solid matter from suspensions, resulting in dips of progressively lower concentrations as increasing numbers of animals pass through the vats. A concentration of 0.06 per cent gamma isomer is recommended as being considerably higher than that required under ideal conditions and should be ample to provide for whatever allowances must be made on the farm and ranch.

The most striking feature of these findings is the fact that only one dipping in BHC will suffice to destroy the most severe infestation of psoroptic mites on sheep. This is a distinct advantage over the action of lime-sulphur and nicotine-sulphate, both of which require two dippings at ten-to 14-day intervals to achieve the eradication of an infestation. Another strong recommendation centers on the use of cold water; it is necessary merely to fill the dipping vat with water ranging in temperature from 60° to 85° F., from any source available. Sufficient wettable BHC is added to establish a 0.06 per cent gamma isomer content, the contents are adequately stirred, and the dip is ready to use. The material, so far as is known, does not deteriorate with age, either in the dry form or when mixed with water in the dipping vat. It has also been shown that BHC has such a lasting residual effect against the sheep scab mite that animals treated with the chemical can be turned back onto old bedgrounds or into barns or sheds previously occupied by infested animals without the slightest danger of becoming reinfested.

In conclusion, despite its unquestionable record against psoroptic scabies of sheep, BHC is not yet recognized by the Bureau of Animal Industry for official dipping of scabies-infested sheep in interstate movement. This is not a result of any doubt as to the effectiveness of the product, but primarily because its use is not in conformity with the requirement of BAI Order 309 that there be a practical field test for determining the concentration of the material in the dipping vat. It is a matter of record that the existence of such vat-side tests accounted in large measure for the successful use of arsenic trioxide against the cattle fever tick and of lime-sulphur and nicotine-sulphate against scabies of cattle and sheep. The search for such a vat-side test to indicate the concentration of BHC in suspension is now in progress. However, until such time as the U. S. Bureau of Animal Industry will recognize the use of BHC, the chemical can be employed to eradicate scabies within the states and is rapidly being accepted as a splendid weapon against an ancient enemy.
REFERENCES


REPORT OF COMMITTEE ON PARASITIC DISEASES


This year, the Report of the Committee on Parasitic Diseases is devoted entirely to ectoparasites of livestock including cattle grubs, mange mites, spinose ear ticks, lice of livestock and poultry, and sheep ticks.

CATTLE GRUBS

During the year, an experimental cattle grub program was carried out by the Federal Bureau of Animal Industry in cooperation with the States involved or only with their cattlemen in El Paso County, Colorado; Chaves County, New Mexico; Harding, Lawrence, Meade and Hughes counties, South Dakota; and Kittitas County, Washington. The plan of the experiment was to determine on a larger scale than had been attempted heretofore the effectiveness of community programs undertaken on a voluntary basis and employing such methods of control as are currently available. To accomplish this, it was necessary to treat, with standard formulations containing rotenone, all cattle within the boundaries of the areas sufficiently often during the grub season so that a maximum number of grubs would be destroyed. The current plan is to continue this work for at least two or three more years in succession and to gage the results from year to year by counts of grubs and in other ways in order to ascertain the benefits that can be derived from community efforts to destroy these pests.

In Colorado and New Mexico only the common grub, Hypoderma lineatum, was involved, whereas in South Dakota and Washington the common grub, as well as the northern cattle grub, H. bovis, was involved. In El Paso County, Colorado, the area included in the program covered about 400 square miles and contained about 7,250 head of cattle. In Chaves County, New Mexico, the area was practically similar in size and contained about 4,600 head of cattle. In South Dakota approximately 5,500 head of cattle were involved in the western areas in Harding, Lawrence, and Meade counties and about 9,250 head of cattle in the central part of the State in Hughes County. In Kittitas County, Washington, where the entire cattle population has been estimated as being between about 25,000 and 30,000 head, about 22,500 head were actually treated during the winter and spring of 1950. The efficacy of the treatments in the different localities varied considerably, depending, among other things, on the skill of the operators who applied the treatment and the degree of supervision exercised. The efficacy of the work carried out this year will be determined during the winter of 1950-1951, when the average grub population of the cattle in the areas will be ascertained and compared with that of 1950.

SHEEP SCABIES

During the early part of this century sheep scabies was a serious threat to the sheep industry of the western range states. Since 1900 the Bureau of Animal In-
dustry of the U. S. Department of Agriculture, in cooperation with the states, has been fighting sheep scabies. Quarantine measures were adopted which prohibit interstate movement of scabies-infested sheep. Dipping of infested and exposed sheep in lime-sulphur or nicotine-sulphate solutions proved undeniably effective in eradicating the disease in areas where persistent efforts were made to do so. Lime-sulphur and nicotine-sulphate are still the only dips recognized for official dipping of sheep destined for interstate movement.

Although great progress has been made since 1915 in reducing the extent of sheep scabies in this country, the disease has not yet been entirely eradicated. It is still present to an appreciable extent in some states and occurs sporadically in about one-fourth of the states.

In 1949 a rather extensive outbreak of sheep scabies was discovered in New Mexico, following a period of 12 years during which not a single case of scabies was found in any sheep in that state. Prompt and vigorous measures were taken by the State Veterinarian of New Mexico, in cooperation with the U. S. Bureau of Animal Industry, to eradicate the disease, and these efforts were entirely successful. In 1950 a number of western states, especially Colorado, Idaho, Montana, South Dakota, Texas, and Wyoming, developed a renewed interest in sheep scabies, either because scabby sheep were found in these states, or passed through them and thereby lead to the exposure of unaffected sheep. In western South Dakota alone about 8,000 scabby sheep, which were brought in from another state by way of Denver and about 65,000 exposed sheep, were treated with an officially-approved dip. At least two states, Colorado and Arizona, have adopted rigorous measures to prevent the introduction of scabies-affected sheep into their borders.

Controlled experiments conducted by the Zoological Division of the Bureau of Animal Industry showed that benzene hexachloride, a chemical introduced during World War II for the destruction of insects, may be used safely and effectively for the eradication of sheep scabies. The chemical, which is available as a wettable powder, is dispersed in unheated water and used as a single-dipping treatment for scabby sheep.

The results achieved in the eradication of the 1949 outbreak of sheep scabies in New Mexico have been remarkable. The disease, which was introduced through the importation of infested sheep from another state, was eradicated from over 10,000 infested and exposed sheep by a single dipping in benzene hexachloride at a 0.06 per cent concentration of the gamma isomer, which is for practical purposes the active fraction of the compound. Not a single case of scabies has recurred in any sheep in New Mexico so dipped.

Benzene hexachloride has some advantages over the older treatments as well as some disadvantages. Its greatest advantage is its effectiveness as a single-dipping treatment, because it destroys the existing mites and retains its effectiveness on the skin of sheep sufficiently long to kill the newly-hatched mites, thereby eliminating the need of a second dipping. Moreover, the dip need not be heated. Scouring, dyeing and tensile strength of the wool fibers of sheep dipped in benzene hexachloride at the concentration recommended, were not adversely affected. None of the more than 10,000 sheep of all ages treated in New Mexico exhibited the slightest ill effect from the dipping.

The disadvantage of benzene hexachloride is its insolubility in water, which ne-
cessitates its use in the form of a wettable powder or emulsion. The powder, however, settles rapidly to the bottom of the dipping vat, unless the contents are continuously agitated. Moreover, there is as yet no simple field test available to determine the exact concentration of benzene hexachloride in the vat at all times. For this reason, benzene hexachloride is not yet officially recognized for the treatment of scabies-infested sheep destined for interstate movement. However, it may be used for treating scabies in sheep flocks that are not destined for interstate movement.

**CATTLE SCABIES**

Although common or psoroptic cattle scabies is becoming exceedingly rare in the United States, chorioptic and sarcoptic scabies are still fairly common in a number of states. As is well known, sarcoptic scab is more severe in its effects than common scab and is, moreover, much more difficult to eradicate. The importance of the chorioptic or symbiotic scab mite has been frequently underrated, partly because it spreads more slowly than the common scab mite and also because often, but not invariably, the lesions the chorioptic mite produces tend to become localized on the ears, tail and limbs. Actually, however, the chorioptic scab mite can produce lesions that are similar to those caused by the common or psoroptic scab mite.

In the spring of 1948 experiments were conducted by the U. S. Bureau of Animal Industry, in cooperation with the State Veterinarian of Virginia, with benzene hexachloride as a treatment for sarcoptic scabies in cattle. Two sprayings, 12 days apart, with a suspension of technical BHC having a gamma isomer content of 0.075 per cent, eradicated the scab mites in a herd of 150 purebred Shorthorns and brought about a resolution of the lesions in 90 days or less. A herd of 11 head in another State, also affected with sarcoptic scabies, was sprayed only once with a suspension of BHC having a 0.12 per cent gamma isomer content. During a post-spraying observation period that lasted 5 months, no live mites were found on any of the cattle. During the year 1950 further studies were made with BHC as a miticide on cattle, using lindane, which is the pure gamma isomer of BHC and free of the objectionable odor of the technical grade of this chemical. A total of 309 head of cattle, in seven different scabby herds in the State of New York were treated, in cooperation with the State Veterinarian. Two treatments, 10 days apart, with only 0.06 per cent gamma isomer, apparently eradicated chorioptic and sarcoptic mange in three herds, and left only one scabby animal with sarcoptic mites in the fourth herd. In other trials only two animals in one of two herds treated twice, ten days apart, with 0.045 and 0.075 per cent gamma isomer, respectively, retained the chorioptic but not the sarcoptic mites. Another herd treated twice, ten days apart, with 0.075 per cent gamma isomer each time, was apparently cured, thus confirming the results obtained in Virginia in 1948.

Although no final conclusions can as yet be drawn from the data at hand, the indications are that even sarcoptic scabies in cattle, which ordinarily requires four or more treatments to eradicate the mites that cause it and bring about a resolution of the lesions, can be cured with only two and perhaps even a single treatment of technical benzene hexachloride or, preferably, the pure gamma isomer known as lindane.
SPINOSE EAR TICKS

The problem of controlling the spinose ear tick of cattle involves the destruction of the larvae and nymphs present in the ears and preventing, or at least delaying, reinfection with larvae. As a result of field work conducted by the Bureau of Animal Industry, the following mixture was found to be particularly effective both as a lethal and repelling agent: BHC (12 per cent gamma isomer) five parts, xylol ten parts, and pure pine oil 85 parts. For introducing the medicament into the ear, a spring-bottom, pint-size oiler, such as is used for this purpose by cattlemen on western ranges, proved entirely satisfactory. Because of its viscosity, the preparation flows freely from the oiler.

This mixture not only destroyed all ticks in the ears of cattle tested, but prevented reinfection for about 17 days, even when the animals remained in tick-infested corrals. When used on a large scale on farms and ranches in the Southwest, this formulation quickly gained the approval of stockmen, who liked its free-flowing qualities, its cleanliness, ease of application, as well as its effectiveness in killing ticks and preventing reinfection for about two and one-half weeks. Recently, equally good or even better results were obtained in limited trials with another formulation, consisting of chlordane 5 parts, and pure pine oil 95 parts.

SWINE MANGE

Sarcoptic mange of hogs occurs in most sections of the United States and is especially prevalent in the Corn Belt where swine are raised in greatest number. Despite the use of various treatments in past years, including self-oilers, medicated wallows and frequent spraying of and dipping in, various formulations of miticides, the disease was apparently not checked to any significant extent. Tests carried out a few years ago by veterinarians of the Bureau of Animal Industry showed that benzene hexachloride having an approximate gamma isomer content of 0.125 per cent may be used safely and successfully as a single-treatment spray or dip for the eradication of mange in hogs. During the year additional trials were made by the U. S. Bureau of Animal Industry in New Mexico and South Dakota, using lindane in lieu of technical BHC, on a total of nearly 500 mange-infested hogs. A 0.1 per cent suspension of lindane destroyed all larval, nymphal, and adult mites in about 6 hours. Three herds involved in this treatment were examined at regular intervals during the fall of 1949, the winter of 1949-50, and again in the spring of 1950 after the sows in each herd had farrowed. The results were consistently negative for mites and lesions. In order to provide a margin of safety, so far as the concentration of the chemical is concerned, 4 pounds of wettable lindane, containing 25 per cent of the active ingredient per 100 gallons of water, is recommended for the eradication of swine mange. This gives a concentration of 0.125 per cent gamma isomer.

LICE ON LIVESTOCK

Although lice have been known as livestock pests probably from time immemorial, there is comparatively little information in the veterinary literature on the precise injuries that these parasites produce. Recently parasitologists of the Bureau of Animal Industry have studied the effects of blood-sucking lice on the health of cattle. Briefly, they determined that heavy louse infestation can produce an anemia so
severe that the affected animal may be unable to survive unfavorable environmental conditions, such as severe cold, or other conditions that a normal animal could weather safely. Moreover, it was determined that the degree of anemia in infested cattle is proportional to the degree of louse infestation. One cow, which succumbed to louse infestation in New Mexico, showed a hematocrit of only ten, or about one-fourth the normal for cattle in that area. The hematocrit reading expresses in percentage the volume of the packed red blood cells in relation to the volume of whole sample of blood tested. The animal that died had a louse population estimated as amounting to nearly one and one-quarter millions of these pests.

There are a number of chemicals that are effective in destroying lice on cattle. Among the best are wettable DDT, which should be used preferably in a dip, but may be used as a spray when a dipping vat is not available, in a concentration of 0.5 per cent of the chemical; wettable BHC or preferably lindane, at a 0.06 per cent concentration of the gamma isomer, may be used as a spray; and wettable chlordane at a concentration of 0.3 per cent of the chemical may be used as a spray. DDT, technical BHC, and chlordane should not be used to treat dairy cattle. Lindane may be used on dairy cattle.

DDT as recommended for cattle lice is equally effective for the destruction of lice on sheep and goats. Other treatments for these animals are dips containing 0.045 per cent gamma isomer BHC (using the wettable product), or preferably wettable lindane, or 0.25 per cent wettable or emulsifiable chlordane. Lice on hogs can be readily destroyed by dipping in or spraying with 0.06 per cent gamma isomer BHC or preferably lindane, using wettable products. Chicken lice can be destroyed by spraying or painting the roosts, ledges, and all other places on which the birds might roost, with 1 per cent wettable or emulsifiable lindane. This chemical is volatile, its fumes penetrating the feathers of the birds and killing the lice indoors or outdoors.

**SHEEP KEDS**

Sheep keds or so-called ticks are easily destroyed by various chemicals, and, in fact, can be readily eradicated whenever sheepmen make up their minds to do so. The simplest, cheapest and least objectionable treatment consists in dipping sheep in a dip containing per 100 gallons of water one pound of cube powder or derris powder having a 5 per cent rotenone content. The dipping should be done as soon after shearing as the shear cuts have healed. At that time the ked population is usually at its lowest level. Where dipping vats are not available, shorn sheep may be sprayed with 0.03 per cent lindane, which should be made up by dispersing per 100 gallons of water one pound of wettable lindane containing 25 per cent of the active ingredient. In areas where scab exists or in which sheep have been exposed to scabies, the strength of the lindane spray should be increased to 0.06 per cent, and the sheep dipped rather than sprayed to protect them from scabies as well as destroy the keds.
LABORATORY STUDIES ON THE IMMUNIZING VALUE OF HEMORRHAGIC SEPTICEMIA BACTERIN AND BLACKLEG BACTERIN

I. S. DANIELSON, PH.D., AND R. BOLTON, B.S.

Lederle Laboratories Division American Cyanamid Company Pearl River, New York

Hemorrhagic Septicemia Bacterin is prepared from chemically killed whole broth cultures of Pasteurella multocida and Blackleg Bacterin is prepared from chemically killed whole broth cultures of Clostridium chauvoei. These preparations are designed to confer increased resistance to the specific infections caused by P. multocida and Cl. chauvoei upon susceptible animals properly immunized with each agent.

As of May 1, 1950, twenty-three commercial firms held licenses granted by the U. S. Bureau of Animal Industry for the production of blackleg bacterins, and twenty-four firms held licenses for the production of hemorrhagic septicemia bacterins. The wide use of these preparations is indicated by the production figures issued by the U.S.B.A.I. for the fiscal year ending June 30, 1950, for these two products. During this period, over 100,000 liters of bacterin containing the blackleg component and over 68,000 liters of bacterin containing the hemorrhagic septicemia component were produced by these licensees.

There is ample evidence from field reports that these products do aid greatly in the control of the specific conditions for which they were designed. On the other hand, there are published reports (1) indicating that failures have occurred. It must be recognized that a reported failure in herd protection following immunization with a given preparation may not necessarily be sufficient evidence of the poor quality of the material at time of release. Such factors as improper storage and improper use of the bacterin, condition of the animals at time of inoculation, refractory conditions of individual animals and recent exposure prior to inoculation must be considered.

In spite of the fact that both blackleg bacterin and hemorrhagic septicemia bacterin have proved themselves to be useful aids in the prevention of these specific diseases in domestic animals, it is still highly desirable that each lot of these preparations released on the market comply with some minimum standards that can be evaluated in laboratory animals. A great deal of work must be done to correlate such laboratory data with actual field experiences before true evaluation can be accomplished.

It is the purpose of this paper to record some of our experiences in evaluating blackleg bacterin and hemorrhagic septicemia bacterin in laboratory animals.

BLACKLEG BACTERIN

Some years ago, we made a number of attempts to evaluate our blackleg bacterin by what might be considered a routine protection test in guinea pigs. That is, two immunizing doses of 1 ml. each of blackleg bacterin or other bacterin containing Cl. chauvoei, were administered subcutaneously to guinea pigs. After a rest period of 2 to 3 weeks, these pigs were challenged with a freshly grown (24–30 hour)
culture of *C. chauvoei*. The challenge dose was varied from 0.25 ml. to 2 ml., given intramuscularly. At the same time, the *C. chauvoei* culture was titrated in unimmunized guinea pigs.

As can be seen in Table I, the lethal dose of our culture, grown under our conditions, was between 0.25 and 0.5 ml. Therefore, a 2 ml. challenge represented only 4 to 8 lethal doses, or at least this was our interpretation at the time. The data in Table I illustrate the protective response obtained in this type of experiment.

Since these results were not very satisfactory, it was decided to try the calcium chloride technique for the activation of washed suspensions of anaerobic spores, as first described by Bullock and Cramer (2) in 1919. This technique was found reliable by Henderson (3) and was employed by Roberts (4) in the method he proposed for the evaluation of *C. chauvoei* bacterins.

For this work, a *C. chauvoei* spore suspension was prepared by aging a 24-hour broth culture at room temperature for a period of 2 to 4 weeks. The spores were then centrifuged and washed three times with physiological salt solution, and finally resuspended in physiological salt solution to a density of approximately one billion cells per ml. An injection dose of activated spore suspension consisted of 0.1 ml. of standard spore suspension, the desired volume of 5% calcium chloride (CaCl$_2$·2H$_2$O)* solution and the volume adjusted to 1.0 ml. with physiological salt solution. This dilution was prepared immediately before injection. All challenge injections were given intramuscularly into the muscles of a back leg.

In our preliminary work to determine the optimum concentration of calcium chloride, we again encountered irregular deaths; some deaths even occurred in guinea pigs receiving only 0.25 ml. calcium chloride solution. The possibility of carrying pathogenic surface organisms into the injection site on the needle puncturing the skin was considered. The injection site was, therefore, shaved and thoroughly swabbed with 3% tincture of iodine. With this added precaution, we were able to obtain consistent results.

Table 2 illustrates the type of results obtained with and without the use of aseptic precautions. The injection of calcium chloride intramuscularly does produce

* Hereafter, 5% calcium chloride will signify 5% CaCl$_2$·2H$_2$O.

<table>
<thead>
<tr>
<th>DATE</th>
<th>NO. DOSES</th>
<th>DIED/TOTAL CHALLENGED</th>
<th>CHALLENGE LEVEL CAUSING DEATH IN CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/10/45</td>
<td>1</td>
<td>0/1 2/2 2/2 1/1 1/1</td>
<td>0.5 -1.0 ml.</td>
</tr>
<tr>
<td>2/21/46</td>
<td>2</td>
<td>0/2 0/2 0/2 0/2 1/3</td>
<td>0.25-0.5 ml.</td>
</tr>
<tr>
<td>5/29/46</td>
<td>2</td>
<td>0/2 0/3 0/3 1/3</td>
<td></td>
</tr>
<tr>
<td>6/28/46</td>
<td>2</td>
<td>0/2 0/3 0/3 1/3</td>
<td>0.1 -0.3 ml.</td>
</tr>
</tbody>
</table>
some local tenderness and edema. One ml. of 5% calcium chloride caused ulceration which subsequently healed. It will be noted that all guinea pigs which were only shaved and received 1.0 ml. of 5% calcium chloride solution survived, while all those receiving 0.5 ml. died; and two died which received only 0.25 ml. of solution. However, if the injection site was swabbed with 3% tincture of iodine, all guinea pigs in this experiment survived.

To determine the optimum concentration of calcium chloride to be added to a

### Table 2

Comparison of guinea pig survival following the intramuscular injection of CaCl₂ solutions into iodine-treated and non-treated injection sites

<table>
<thead>
<tr>
<th>VOL. 5% CaCl₂ SOL. PER INJECTION DOSE</th>
<th>INJECTION SITE SHAVED ONLY. (5 guinea pigs per point.)</th>
<th>INJECTION SITE SHAVED &amp; SWABBED W. 3% TINCTURE IODINE. (5 guinea pigs per pt.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 ml.</td>
<td>L L L</td>
<td>L L L L L</td>
</tr>
<tr>
<td>0.5 ml.</td>
<td>D D D</td>
<td>L L L L L</td>
</tr>
<tr>
<td>0.25 ml.</td>
<td>D D L</td>
<td>L L L L L</td>
</tr>
<tr>
<td>0.125 ml.</td>
<td>L L L</td>
<td>L L L L L</td>
</tr>
</tbody>
</table>

D—died  
L—lived

### Table 3

Data demonstrating the effect of variable concentrations of CaCl₂ with a fixed volume of Cl. chauwoo spores on the survival rate of guinea pigs injected intramuscularly

<table>
<thead>
<tr>
<th>VOL. 5% CaCl₂ SOL. PER INJECTION DOSE</th>
<th>RESULTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guinea pigs received 0.1 ml. spore suspension</td>
<td>Guinea pigs received 1.0 ml. spore suspension</td>
</tr>
<tr>
<td>0.5 ml.</td>
<td>D D D</td>
<td>D D D</td>
</tr>
<tr>
<td>0.25 ml.</td>
<td>D D D</td>
<td>L L L</td>
</tr>
<tr>
<td>0.125 ml.</td>
<td>L L L</td>
<td>L L L</td>
</tr>
<tr>
<td>0.0625 ml.</td>
<td>L L L</td>
<td>L L L</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D—died  
L—lived

challenge dose of Cl. chauwoo spores, a series of guinea pigs were injected with fixed volumes of spore suspensions and variable quantities of 5% calcium chloride solution. The two levels of stock spore suspension tested was 0.1 and 1.0 ml. The results are presented in Table 3. From these data, it appears that an activating dose of 5% calcium chloride is in the range of 0.25 ml. and 0.5 ml. per injection dose.

It now became important to learn to what degree Cl. chauwoo spores could be activated. Therefore, a series of guinea pigs was injected with a fixed volume of 5% calcium chloride solution and varying concentrations of Cl. chauwoo spores. The two levels of 5% calcium chloride solution studied were 0.25 ml. and 0.5 ml. mixed with 0.1 ml. of various dilutions of the stock Cl. chauwoo spore suspension and made
to 1 ml. with physiological salt solution. The data presented in Table 4 illustrate the results obtained.

From Tables 3 and 4, it is seen that a washed spore suspension which fails to produce death in guinea pigs when administered in 1 ml. volumes intramuscularly, is capable in 1 millionth the concentration of producing death in guinea pigs provided the injection dose contained the equivalent of 0.5 ml. of a 5% solution of calcium chloride.

From a study of these data, we are convinced that, in the earlier experiments as illustrated in Table 1, we were not challenging these animals with 4 to 8 lethal doses, but rather many thousands of lethal doses. The relatively large volume of culture required served the purpose of furnishing a minimal activating dose of

<table>
<thead>
<tr>
<th><strong>TABLE 4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data illustrating the survival rate of guinea pigs injected with Cl. chauvoei spores in the presence of CaCl₂</strong></td>
</tr>
<tr>
<td><strong>INJECTION DOSE CONTAINED 0.1 ML. OF STOCK SPORE SUSPENSION DILUTED:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1:10</td>
</tr>
<tr>
<td>1:100</td>
</tr>
<tr>
<td>1:1,000</td>
</tr>
<tr>
<td>1:10,000</td>
</tr>
<tr>
<td>1:100,000</td>
</tr>
<tr>
<td>1:1,000,000</td>
</tr>
<tr>
<td>No spores</td>
</tr>
</tbody>
</table>

D—died  
L—lived

some factor—call it aggressin, if you wish. This assumption is partially borne out by the following experiment.

A 24-hour culture of Cl. chauvoei was filtered to yield a sterile culture filtrate. A constant volume (0.9 ml.) of this filtrate was mixed with 0.1 ml. of various dilutions of our stock Cl. chauvoei spore suspension. One ml. of each mixture was injected intramuscularly into each of 5 guinea pigs. The results are shown in Table 5. Although the results recorded are not as clear-cut as might be desired, we do see that 4 out of 5 guinea pigs died as a result of the injection of 0.1 ml. of a 1:100 dilution of the spores. From previous experience, we could have expected that 0.25 to 0.5 ml. of the whole culture (cell density between 1 and 1.5 billion per ml.) would have been needed to produce similar results. It is of interest to note that 100 times as many spores did not cause death in all guinea pigs; in fact, one less died.

From this type of work, it appeared that we had a very satisfactory method for challenging normal guinea pigs with a Cl. chauvoei spore suspension, with the assurance of producing 100% deaths within a predictable range. We were then ready to test this challenge upon guinea pigs previously immunized with bacterins containing the Cl. chauvoei component. A group of guinea pigs were available which had
been immunized with Chauvoei-Septicus Bacterin with the original intention of using a whole broth culture of Cl. chauvoei as challenge material, as earlier described in this paper. These guinea pigs had received subcutaneously two 1 ml. doses of the bacterin at a 4-weeks interval. After a rest period of two weeks, these pigs, along with non-immunized controls, were challenged intramuscularly with 1 ml. of material containing 0.1 ml. of varying dilutions of the stock spore suspension, 0.5 ml. of 5% calcium chloride solution, with the volume adjusted to 1 ml. with physiological salt solution. Table 6 records the results.

We have reason to believe that the one nonimmunized pig surviving the 1:1000 dilution spore challenge was in some manner immunized before challenge, since a postchallenge blood sample showed a high agglutinin titer. It, therefore, appears that some of these guinea pigs withstood at least 10,000 times the lethal dose of spore challenge. This type of experiment has been repeated many times.

The data recorded in Table 7 further illustrate the type of protection which is obtained by the two-dose immunization technique in guinea pigs, followed by a
calcium chloride activated \textit{Cl. chauvoei} spore challenge. The data here presented are summarized from animals immunized with Blackleg Bacterin, Chauvoei-Septicus Bacterin, and Chauvoei-Novyi Bacterin.

From these data, it can be seen that many of the immunized guinea pigs withstood a spore challenge from 10,000 to 100,000 times the lethal dose.

Since the two-dose immunization schedule so effectively protected guinea pigs against a subsequent activated spore challenge, we felt that one immunizing dose might give results which would more nearly lend itself to the relative evaluation of different blackleg bacterins. With this in mind, a routine lot of Blackleg Bacterin, having a cell density between 1 and 1.5 billion cells per ml., was selected as the immunizing agent. Groups of guinea pigs were injected with 1 ml. of the undiluted bacterin, and with 1 ml. of 1:2, 1:4, and 1:8 dilutions of the bacterin. After a rest period of 4 weeks, groups of guinea pigs were challenged with various dilutions of the stock suspensions of \textit{Cl. chauvoei} spores as is indicated in Table 8. The challenge doses of spores were adjusted to a volume of 1 ml. and contained the equivalent of 2.5\% calcium chloride.

From an inspection of these data, it is seen that a one-dose immunization schedule on guinea pigs did result in appreciable protection against a live spore challenge. However, for solid immunity, the two-dose procedure was necessary. Furthermore, these data indicate that cell concentration in the bacterin below approximately 1/4 billion cells per ml. fails to confer much protection on guinea pigs when only 1 dose is administered.

The work of Henderson (3) demonstrated that the "O" antigen of \textit{Cl. chauvoei} is a good immunizing antigen, and that this antigen is identical for the various strains studied, even though these strains were of different host (bovine and ovine) origin and were obtained from various parts of the world, namely, England, South Africa.
and Australia. Recently, we had occasion to test in guinea pigs a blackleg bacterin prepared in New Zealand. The test animals immunized with the product were protected against our live spore challenge to the same degree as those immunized with a bacterin prepared from an homologous strain. There is no evidence that immunogenically different strains of *Clostridium chauvoei* occur as the causative agent for blackleg. Therefore, a method which would establish a minimum standard for an immunizing agent would be of great benefit. Roberts (4) using essentially the same method we have been led to employ, found that only nine out of 20 preparations tested passed his minimum requirements. However, only two of those failing were formalized whole culture vaccines, and one of these could not be identified as *Clostridium chauvoei* on morphological examination.

From the data presented here, which confirms the findings of Roberts in all essential respects, it appears possible to devise a guinea pig protective test which will eliminate grossly inferior products. This test has not been developed to a degree which will measure small differences in antigenic value; however, from a practical point of view, this may not be essential. Briefly, the method we have been employing routinely is as follows: a group of guinea pigs is immunized by administering subcutaneously two 1 ml. doses of bacterin at a two-week interval. After a rest period of two weeks the immunized guinea pigs, together with retained control guinea pigs, are challenged intramuscularly with at least 100 lethal doses of *Clostridium chauvoei* spore suspension activated with calcium chloride. On the basis of 80% survival among the immunized animals for a satisfactory test, we find that the majority of the lots of blackleg bacterin produced are satisfactory. However, an occasional lot of material will fail to pass this test. We, therefore, must assume that this lot is inferior to the majority in its ability to confer immunity on guinea pigs, and thus, presumably, is unsatisfactory for use in cattle and sheep.

### Table 8

<table>
<thead>
<tr>
<th>Challenge Dose Contained 2.5% CaCl₂ &amp; 0.1ml of Stock Spores Diluted:</th>
<th>Concentration of Stock Bacterin Per Immunizing Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Undiluted</td>
</tr>
<tr>
<td>Survivors Total</td>
<td>%</td>
</tr>
<tr>
<td>1:1</td>
<td>9/10</td>
</tr>
<tr>
<td>1:10</td>
<td>8/9</td>
</tr>
<tr>
<td>1:100</td>
<td>7/9</td>
</tr>
<tr>
<td>1:1,000</td>
<td>5/10</td>
</tr>
</tbody>
</table>

Controls

| 1:1,000 | 0/5 | 0% |
| 1:10,000 | 0/6 | 0% |
| 1:100,000 | 4/6 | 67% |
HEMORRHAGIC SEPTICEMIA BACTERIN

Bacterins containing hemorrhagic septicemia component are second in volume of all the bacterins produced for the prevention of disease in animals. Still, the determination of antigenic value of this bacterin is in a more unsatisfactory position than that of Blackleg Bacterin. The reasons for this unsatisfactory condition may be many. The following may be mentioned.

1. The strains to be used in the preparation of a bacterin—There are numerous published reports (5-12) demonstrating that more than one immunogenically different strains should be included in a bacterin used for general preventive immunization against pasteurellosis.
2. Cultures of *P. multocida* may lose virulence in the laboratory, even for a highly susceptible test animal such as the white mouse.
3. Lack of information as to value of laboratory data in terms of field experience.
4. An incomplete knowledge of the antigenic structure of the genus.

It is not the purpose of this paper to review the literature dealing with various types of Pasteurella. We wish only to present the method we have been employing for the past several years in the study of the immune response produced in laboratory animals with the use of Pasteurella bacterin, either alone or in combination with other bacterial antigens.

We have been convinced that more than one antigenically important type of *Pasteurella multocida* must be considered and, therefore, our data are reported in reference to types. There is no agreement as to the number of types, nor is there comprehensive data indicating the incidence of infections produced by a given type of *P. multocida* in any one species of domestic animal. As many as eight types have been proposed (12). The data here reported deal with the three types described by Little and Lyon (9). The cultures used in this study were originally isolated from cattle, buffalo, and dog.

In 1936, Priestley (13) listed the following points in connection with the preparation of an efficient vaccine against *Pasteurella septica* infections.

1. A highly virulent and markedly capsulated strain of organism should be used (virulence measured by mouse injections).
2. The time and temperature of incubation should be optimal for capsule formation.
3. Suspensions should be treated in such a way that, while the organisms are killed, the capsular antigen is unharmed.

In our work, we have not specifically followed the suggestions of Priestley, at least with the same thoughts in mind. It may well be that similar interpretations can be placed on methods used. We have selected and maintained our strains in a highly virulent state for mice. In the growth of our cultures, we have used as short an incubation period as is consistent with good growth, with the thought in mind that prolonged incubation may cause an enzymatic destruction of the antigen. For small volumes, 100 to 200 ml., we have found that a 6- to 8-hour growth period is satisfactory. For larger volumes, 25 to 40 liters, a longer period (up to 24 hours) is required to attain growth of satisfactory density. We do know that the great majority (90% or more) of the Pasteurella organisms die during a prolonged incuba-
tion period. Such cultures have resulted in bacterins of low antigenic value. This fact may explain the results reported by Carter (14) in which he found a very low level of protection as measured in mice immunized with bacterins prepared from broth cultures incubated 24 to 72 hours, while he could produce an effective vaccine by growing the cultures in embryonated chicken eggs.

The data presented here were obtained with the use of immunizing agents produced in general as follows:

1. Strains were maintained in a state of virulence so that 0.5 ml. of dilutions of $1 \times 10^{-6}$ or higher of broth cultures, injected intraperitoneally, would kill a 16- to 20-gram Swiss mouse.

2. All cultures were grown in a fluid medium containing peptone, sodium chloride, and dextrose.

3. Incubation periods at 37°C varied from 6 to 8 hours.

4. Cultures were killed by the addition of 0.2% to 0.5% formalin. The following cultures were used for study:

<table>
<thead>
<tr>
<th>Strain</th>
<th>Type</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>I</td>
<td>Bovine</td>
</tr>
<tr>
<td>656</td>
<td>II</td>
<td>Buffalo</td>
</tr>
<tr>
<td>449</td>
<td>II</td>
<td>Unknown</td>
</tr>
<tr>
<td>398</td>
<td>III</td>
<td>Canine</td>
</tr>
</tbody>
</table>

With the type of preparation described above, using Strain 656, Type II, a series of groups of white Swiss mice, 16 to 20 grams in weight, were immunized by administering, intraperitoneally, two 0.5 ml. doses of the various dilutions of bacterin at weekly intervals, as is indicated in Table 9. To a portion of each dilution of bacterin was added sufficient sterile 20% alum solution to give a final concentration of 0.1% alum. The pH was adjusted to 6 ± 0.2. One week after the second immuniz-

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**Table 9**

*Survival rate in mice immunized with two doses of 0.5 ml. of dilutions of *P. multocida* (Type II) bacterin, both without alum and containing 0.1% alum*

*All mice challenged with 10 to 100 lethal doses of virulent culture of the homologous strain*

<table>
<thead>
<tr>
<th>BACTERIN</th>
<th>CHALLENGE DILUTION</th>
<th>350 × 10⁴</th>
<th>100 × 10⁴</th>
<th>10 × 10⁴</th>
<th>1 × 10⁴</th>
<th>0.1 × 10⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without alum</td>
<td>$1 \times 10^{-6}$</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>88%</td>
<td>62%</td>
</tr>
<tr>
<td></td>
<td>$1 \times 10^{-7}$</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>68%</td>
<td>19%</td>
</tr>
<tr>
<td>0.1% alum</td>
<td>$1 \times 10^{-6}$</td>
<td>100%</td>
<td>75%</td>
<td>50%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>$1 \times 10^{-7}$</td>
<td>100%</td>
<td>75%</td>
<td>43%</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

Control titration: Dilution $1 \times 10^{-8}$—0% survived

$1 \times 10^{-9}$—80% survived
ing dose, each mouse was challenged by the subcutaneous injection of 0.5 ml. of a dilution of a young virulent homologous culture containing between 10 and 100 times the minimal lethal concentration of *P. multocida*. All mice were observed for 7 days following challenge.

From these data we can conclude that a very effective immunizing agent can be prepared with this strain and type of *Pasteurella multocida* as measured by active immunity tests in mice. These data also indicate that the addition of alum to this type of preparation is of very little or no value as an adjuvant.

Similar experiments have been conducted with the use of Type I strain No. 53 and Type III strain No. 398, as shown in Table 10. These results indicate than an effective immunizing bacterin can be produced from these two types of *Pasteurella multocida* although, in all experiments we have performed, our Type I strain has been somewhat inferior to Types II and III when evaluated on a graded antigen level.

The results presented in the previous two tables were obtained in mice receiving two immunizing injections of the bacterins. It is of interest to know what degree of protection is afforded by a single immunizing dose.

A bacterin was prepared containing equal parts of the three types of *P. multocida* being studied. This preparation was adjusted to a cell concentration of approximately 1 billion organisms per ml. Sufficient alum was added to give a final concentration of 1%. The pH was adjusted to 6.0 ± 0.2. One dose of 0.5 ml. of this preparation was administered intraperitoneally to each of 60 mice, and 0.5 ml. of a 1:10 dilution was administered to each of another group of 60 mice. After a rest period of two weeks, one-half of each group was challenged with freshly grown young cultures of *P. multocida*. The remaining mice were similarly challenged after a rest period of three weeks. The results are presented in Table 11.

From these results, it must be concluded that, under the conditions used, a one-dose immunization schedule in mice does not afford a very high degree of resistance to a laboratory challenge of *P. multocida*.

The results of an experiment recorded in Table 12 are of interest. In this experiment, groups of 30 to 40 mice were immunized with bacterins prepared from individual types of *P. multocida*. The strains used were Type I strain 53, Type II strain 449 and 656, Type III strain 398, and strain 4126* which could not be typed with the use of antiserum prepared against the other three types. Each mouse received two 0.5 ml. immunizing doses of bacterin containing approximately 100 million organisms. After a rest period of approximately one week, each group of 30 to 40 mice were subdivided into groups of 10 mice each. These smaller groups were challenged with a subcutaneous injection of 0.5 ml. (100 to 1000 lethal doses) of homologous and heterologous freshly grown young culture of *P. multocida* as indicated in the table. It will be noted that there was very little or no cross protection conferred on the mice by the various types of Pasteurella. Strain 4126, which could not be typed by agglutination tests with antiserum prepared against the other three types of Pasteurella, appears to be another type of this organism.

* Strain 4126 was kindly furnished to us by the Cutter Laboratories.
## Table 10
**Survival rate in mice immunized with two doses of 0.5 ml. of dilutions of P. multocida, Types I and III bacterin. All mice challenged with 10 to 1000 lethal doses of virulent culture of the homologous strain.**

<table>
<thead>
<tr>
<th>BACTERIN</th>
<th>CHALLENGE DILUTION</th>
<th>% SURVIVORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number cells per immunizing dose</td>
</tr>
<tr>
<td>Type I, strain 53</td>
<td>1 x 10⁻⁶</td>
<td>87%</td>
</tr>
<tr>
<td></td>
<td>1 x 10⁻⁸</td>
<td>86%</td>
</tr>
<tr>
<td>Type III, strain 398</td>
<td>1 x 10⁻⁴</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>1 x 10⁻⁶</td>
<td>67%</td>
</tr>
</tbody>
</table>

### Control Titration

<table>
<thead>
<tr>
<th>Dilutions</th>
<th>% SURVIVORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 10⁻⁸</td>
<td>0%</td>
</tr>
<tr>
<td>1 x 10⁻⁵</td>
<td>0%</td>
</tr>
<tr>
<td>1 x 10⁻⁶</td>
<td>0%</td>
</tr>
</tbody>
</table>

## Table 11
**Survival rate in mice immunized with one 0.5 ml. injection of P. multocida bacterin (containing 1% alum) followed by a live culture challenge in 2 and 3 weeks.**

<table>
<thead>
<tr>
<th>BACTERIN</th>
<th>HOMOLOGOUS CHALLENGE DILUTION</th>
<th>% SURVIVORS</th>
<th>Number cells per immunizing dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2 weeks rest period</td>
<td>3 weeks rest period</td>
</tr>
<tr>
<td>Type I, strain 53</td>
<td>1 x 10⁻⁵</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Type II, strain 656</td>
<td>1 x 10⁻⁵</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Type II, strain 449</td>
<td>1 x 10⁻⁶</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>Type III, strain 398</td>
<td>1 x 10⁻⁶</td>
<td>0%</td>
<td>7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CULTURE</th>
<th>% SURVIVORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control titration dilution for</td>
</tr>
<tr>
<td></td>
<td>2 weeks rest period</td>
</tr>
<tr>
<td></td>
<td>1 x 10⁻⁸</td>
</tr>
<tr>
<td>Type I, strain 53</td>
<td></td>
</tr>
<tr>
<td>Type II, strain 656</td>
<td></td>
</tr>
<tr>
<td>Type II, strain 449</td>
<td></td>
</tr>
<tr>
<td>Type III, strain 398</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY

An evaluation of the antigenic value of the Cl. chauvoei component in bacterins can be obtained by immunity studies conducted in guinea pigs. To obtain consistent results, the challenge culture should be accompanied by an activating agent such as calcium chloride. To establish solid immunity in guinea pigs, it is essential that they be given two immunizing doses of the bacterin. No attempt has yet been made to correlate the protective value of a Cl. chauvoei bacterin measured in guinea pigs with the results that can be expected in the field.

Data are presented demonstrating that an immunogenically effective Pasteurella multocida bacterin can be evaluated by immunity studies in mice. To establish marked resistance in mice to laboratory challenge of P. multocida, it is essential to administer two immunizing doses of the bacterin. Data are presented demonstrating the lack of cross-immunogenic protection of selected strains of P. multocida as measured in mice.

BIBLIOGRAPHY

REPORT OF THE COMMITTEE ON BIOLOGICALS AND PHARMACEUTICALS


It is the function of this committee to bring to the attention of the Association new biological and pharmaceutical agents useful in the prevention, treatment, and diagnosis of diseases in animals.

BIOLOGICAL AGENTS

Communication from the Chief of the U.S.B.A.I. cites issuance of license for the following new biologic products:
1. Rabies vaccine, modified virus, chick-embryo origin (vacuum dried), authorized 4-17-50*.
3. Cl. chauvei-septicus Pasteurella bacterin, authorized 12-1-49.
4. Newcastle disease antigen, authorized 1-17-50. This agent is recommended for use in the hemagglutination-inhibition test for the diagnosis of New Castle disease.

The following biological products were discontinued during the past year:

On order from the United States Bureau of Animal Industry during the past year, the production of desiccated Brucella Abortus Vaccine (Strain 19) in multiple dose containers was discontinued on December 31, 1949. On March 17, 1950, a group representing the United States Livestock Sanitary Association met with officials of the Federal Bureau of Animal Industry to discuss this order. However, the data presented and the conclusions reached following this meeting are not available for this report.

The viability of Brucella Abortus organisms (Strain 19) after reconstitution of the desiccated vaccine has been questioned by some individuals. During the past year a report indicating that such organisms were quite viable and remained so, if following reconstitution they are maintained under refrigeration, was published. Satisfactory viability of the organisms was demonstrated for a period of 36 days after

* Rabies vaccine, modified virus, chick-embryo origin (vacuum dried) is being produced under a special license as provided in Section 102.7 of B.A.I. Order 381.
the vaccine was restored and kept at refrigerator temperature (2° to 5° C.). This would indicate that desiccation does not cause significant physiologic change or damage to the organisms in the vaccine.

**BRUCELLA “MUCOID” VACCINE**

A statement with respect to Mucoid Brucella Abortus Vaccine (Huddleson) may be of interest and possibly should be made by this committee. Since it is difficult to obtain the desired information concerning the vaccine, it occurred to us that the report as given in the quoted material below would be in order. This report (1) was prepared by the Subcommittee on Research of the National Brucellosis Committee.

1. The exact make-up or content and the exact methods of production of M-vaccine have not been described. This is unique in the history of such products.

2. A permit for the production of M-vaccine for interstate sale has not been requested of the Bureau of Animal Industry by those concerned. Before a license of this nature can be granted, the firm or individual must submit satisfactory proof of proper production facilities, production procedures, proper labels, and experimental protocols and literature showing the value of the product.

3. Adequate, controlled experiments have not been conducted; hence, neither the merits nor the dangers of M-vaccine are known.

4. When employed in cattle, M-vaccine has not produced appreciable blood reactions such as those encountered with Strain 19.

5. Whether or not M-vaccine is dangerous for people is not known.

6. Patience is advised while M-vaccine is being evaluated.”

The use of chemicals in the prophylactic control of coccidiosis, especially infections due to *E. tenella*, apparently is widespread. Of these chemicals, sulfaquinoxaline was the one initially used in low concentration in feed or water for long periods of time. More recently three other compounds have been released for similar use. They are m m’ dinitrodiphenyl disulfide (nitrophenide) (megasul), nitrofurazone (furacin) (NFZ) and 2 2’-methylene-bis-(4-chloro-phenol) (Parabis-90) a bisphenol compound.

It would appear that low concentrations of these compounds are used rather extensively for the prevention of coccidiosis in chicken flocks, particularly by the broiler raising industry.

Within the past year, two new compounds that appear to have value in the management of enterohepatitis (blackhead) in turkeys have been reported. These compounds are 2 amino-5-nitrothiazole (Enheptin-T) and 2 amino-5-nitropyrimidine (Enheptin-P).

Low concentrations of these compounds in dry mash appear to possess value when the medicated food is given prophylactically to turkeys. One of these compounds, 2-amino-5-nitrothiazole, is available commercially. In experimental studies, this compound has aborted the disease in birds that had been artificially infected with cecal worm ova, and in which the disease had progressed to the point where typhilitis was evident.

2-amino-5-nitrothiazole is recommended for the control of enterohepatitis (blackhead) in turkeys as follows: 1. Prevention—concentration of 0.05 per cent in the feed; 2. Treatment, when death losses are occurring in flocks—concentration of
0.1 per cent in the feed for two weeks, and if necessary 0.05 per cent for an additional week.

The problem of taeniasis in sheep and its effect on the sheep-raising industry has been debated on occasions. Some individuals are of the opinion that these parasites are not very important from an economic standpoint, whereas others take the opposite view.

Within recent years, data indicating that lead arsenate and, more recently, that 2,2′ dihydroxy 5-5′ dichlorodiphenylmethane (Di-Phenthane-70) are of value in the treatment of sheep harboring certain species of tapeworms, especially the fringed tapeworm Thysanosoma actinioides, have been presented.

Further studies with this problem and with these compounds should be conducted.

Various Animal Protein Factor (APF) concentrates, especially those products or by-products of controlled commercial fermentations are of great interest currently to the animal and poultry industry. These APF concentrates, obtained from culture media in which certain micro-organisms are grown, possess the ability to increase the growth rate and apparently also the utilization of food by swine and poultry. Relatively small amounts of material are required to influence profoundly the growth rate of animals, resulting in more efficient animal production.

Several of these commercial APF concentrates are the by-products of antibiotic producing fermentations. In addition to their vitamin B₁₂ content, various residual levels of the antibiotics, and possibly antibiotic residues appear in these concentrates. Since experimental evidence indicates that under some conditions additional benefits may be ascribed to the presence or incorporation of certain definite levels of antibiotics in the rations of poultry or swine, we believe that APF concentrate labeling should state clearly and distinctly the amounts of the specific antibiotics, vitamins, or other factors present so that adequate ration levels may be maintained.

The use of hormones in the management of animal production is receiving considerable attention by the livestock industry and veterinarians. During the past year or so a new synthetic estrogen compound, dienestrol, was introduced for veterinary use.

Dienestrol is indicated for the treatment of shy-breeding or hard-to-settle cows where the disorder is considered to be due to delayed ovulation and not to uterine infection or major organic disease.

The iodination of casein under controlled conditions results in a substance (Protamone) (Thyroprotein) that possesses marked thyroidal activity. This substance, if added in proper dosage to the feed for lactating cows, will influence favorably milk production. Iodinated casein compound also can be added to swine feed to increase growth of the animal, and to poultry feed to stimulate growth of the young birds. Since this compound possesses substantial hormonal activity, it is advisable that animals receiving this substance be observed carefully and frequently for evidence of undesirable effect.

A preliminary report indicates that N-methyl-tetrahydro-methyl-nicotinate-p-carboxyphenyl-stibonic acid (Anthelin) has value in the treatment of taeniasis and ascariasis in dogs. The report contains data only on a limited number of animals; however, the results of both efficacy and safety are favorable.
Hyaluronidase is an enzyme that hydrolyzes the gel or so-called "cement-substance" (hyaluronic acid) of connective tissue and in this manner is considered to function as a spreading factor. The agent is used to promote distribution of fluids within tissue, thus increasing the rate of absorption of therapeutic agents or local anesthetics. It has been demonstrated that this enzyme is of value in increasing the rate of absorption of sera, saline solutions, dextrose, calcium solutions, antibiotics, etc. when administered subcutaneously. Also, it has been used with anesthetics when these agents are used for infiltration of local areas.

The Federal Security Agency, Food and Drug Administration is active in the enforcement of the Federal Food, Drug and Cosmetic Act and frequently takes action against misbranded veterinary medicinal preparations in interstate commerce. Reports on Notices of Judgment during the past year indicate that about 25 such cases were investigated. Several of these are of real importance since they concern preparations that were distributed in large quantities and for which many thousands of dollars were wasted by livestock owners because of false claims made by producers or distributors of the material. Among these cases was one against the so-called alkalizing preparations (2) claimed to have value in the treatment of necrotic enteritis in swine and one with respect to wheat germ oil claimed to be of value in the treatment of infertility, etc. in livestock.

As indicated above, this Federal agency only functions with respect to this type of desirable service in interstate commerce. Worthless products that are produced and sold within a state or commonwealth cannot be handled by the Federal Security Agency, Food and Drug Administration. Unfortunately, only a few states have either laws, regulations or facilities by which they can control such matters. It would seem advisable, therefore, for each state to have an agency to control products manufactured and distributed only in intrastate commerce.

Preliminary experimental results with Rabbit Modified Hog Cholera Virus Vaccine have previously been reported, and it is our understanding that such investigations are currently being pursued by several laboratories. In view of the various problems in connection with the control of this very serious and important disease of swine in this country, it is hoped that soon we may learn of further favorable results with respect to safer and more effective Hog Cholera Vaccines.

The Committee is of the opinion that:

1. Experimental, biological and pharmaceutical materials should be placed only in the hands of qualified individuals for trial use and study.

2. The promiscuous and unrecorded distribution of live vaccines capable of producing disease in livestock and poultry is against the best interests of the animal and poultry industry.

BIBLIOGRAPHY


RHINITIS OF SWINE

L. P. DOYLE, B.S.A., M.S., D.V.M., Ph.D.

Purdue University, Lafayette, Indiana

When the term rhinitis is used broadly, it includes a number of disease entities which may occur in swine. In this paper the discussion shall be limited, except as differentiation features are mentioned, to a dystrophic or atrophic rhinitis which has proved to be important, particularly in certain herds and in certain areas.

Swine raisers in some European countries have had long, and in many instances, discouraging experience with atrophic rhinitis. Some recent investigators believe that the disease was described in Europe as early as 1842. The European reports indicate that atrophic rhinitis rendered profitable swine production impossible in several areas in Europe. Observations of the disease on the North American continent leave little doubt that it is capable of doing great damage to the swine industry under American conditions.

The cause of atrophic rhinitis is undoubtedly an infective agent; however, there is not yet complete agreement as to the exact nature of the causative agent. Some of the best research work on the disease has been done by the Canadian experiment stations. Gwatkin (1) and his coworkers have published a review of recent work on atrophic rhinitis; and also gave the results of their own research. Phillips (2) regarded the disease as highly infectious; and believed that a filterable factor was the primary cause. Moynihan (3) obtained negative results from nasal instillation of aerobic bacteria obtained from cases of rhinitis. He also obtained negative results from nasal instillation of diseased material from naturally occurring cases. Jones (4) stated that the disease was definitely shown to be transmissible.

Gwatkin and his associates (1) showed that nasal instillation of washings from the noses of adult swine affected with rhinitis was followed by the partial or complete disappearance of turbinate structures in baby pigs. The condition was fairly definite at the end of 30 days. The disease was then transmitted from these pigs to other baby pigs by nasal washings. Contact pigs also became affected. Bacteriological and histological examinations failed to show that the disease is caused by bacteria.

Field observations of atrophic rhinitis support the belief that it is infectious and capable of spreading to contact swine. Some herds have been observed where the disease was well developed in pigs before they were weaned. One instance was seen in which animals from a diseased herd were put with pigs from several unaffected sources. The pigs from the unaffected herds were about 10 weeks old when put with the animals from the affected herd. At the end of several weeks a large portion of the pigs from the unaffected sources were showing definite clinical evidence of the disease.

Ordinarily the buildup by the disease in a herd is slow and gradual. Frequently

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Atrophic rhinitis is present for two or three years before its effect is definitely noticed. Usually, however, an affected herd is decidedly unprofitable by the end of three years if nothing is done to eliminate or control the disease. The death loss is negligible.

The symptoms of atrophic rhinitis are not always clearly marked in the individual animal. In fact the symptoms shown by the entire herd are sometimes so vague that postmortem examinations are necessary in order to establish a diagnosis. Sneezing is a common symptom. The sneezing is likely to be more or less violent. Occasionally affected animals make a very great effort to clear the nasal passages by sneezing. There are commonly other signs of nasal irritation, such as rubbing the snout against objects or pushing it into litter or loose soil and by shaking the head. Epistaxis is likely to occur in at least a few animals in the herd. The bleeding from the nose is sometimes so profuse as to undoubtedly play a part in causing unthriftiness in affected animals. One of the most characteristic symptoms of atrophic rhinitis is distortion or disfigurement of the snout and face. This distortion does not always occur; and sometimes it is difficult to detect when it does occur. For instance, in the Berkshire and Yorkshire breeds it may be difficult to distinguish between the effects of atrophic rhinitis and the dish-face which occurs normally in these breeds.

The distorted snout resulting from atrophic rhinitis may be turned to either side or it may be turned up. Sometimes the snout has a pushed-in appearance, causing shortening of the nose and wrinkling of the face. If the atrophic changes in the snout and face happen to be bilaterally symmetrical, the affected hog's head may closely resemble, in shape, that of a dishfaced variety of swine. Care should always be used to distinguish between atrophic rhinitis and ordinary “bull nose”, because they are entirely distinct diseases. Ordinary “bull nose” may cause considerable distortion of the snout due to granulomatous swelling. In “bull nose” there is more or less necrosis and sometimes sloughing of the skin and deeper structures. In considering the symptoms of atrophic rhinitis, it is always well to keep in mind that unthriftiness and retarded growth may be the principal manifestations of the disease.

The pathognomonic lesions of atrophic rhinitis are found within the nasal passages. Partial or complete absence of the turbinate structures can be considered as diagnostic of this disease. The absence of the turbinates is likely to be accompanied by more or less distortion of the snout and face previously mentioned. Accumulations of pus and other types of exudate may be found in the nasal, and more rarely, paranasal sinuses. However, these passages and sinuses are frequently free from accumulations of any kind. In old cases, lung lesions are often found.

The lung lesions are usually circumscribed areas made up of caseous necrotic material. Abscesses are sometimes found in the lungs. It appears likely that most of the lung lesions originate from the inhalation of tissue particles or exudate from the nose.

The control and eradication of atrophic rhinitis of swine should be of considerable concern to livestock disease control officials and to swine producers. There is no doubt that the disease is capable of doing serious damage to valuable herds. If it is
allowed to go uncontrolled it probably will become a serious handicap to pork production.

Experience indicates that the sale of animals from infected herds may spread atrophic rhinitis to healthy herds. Since there is no clinical means of detecting the disease in every individual animal, the whole herd in which affected animals are present would be regarded with suspicion. Perhaps the first need is for educational work in order that the existence and the importance of atrophic rhinitis may be fully appreciated.

REFERENCES

ICTERO-ANEMIA OF SWINE

EARL J. SPLITTER, D.V.M., M.S.
Assistant Professor of Pathology, Kansas State College, Manhattan, Kansas

Ictero-anemia has been recognized as an acute febrile disease primarily of young swine in which the predominating symptoms are a severe hemolytic anemia and icterus. The morbidity of this disease is quite low, often only one or two animals in a herd are visibly affected and the number rarely exceeds ten per cent of the herd. Usually the mortality of affected animals has been reported as being quite high. The disease is seasonal in nature being most prevalent during the summer and early fall. The occurrence is sporadic; however veterinarians in some areas encountering the disease frequently.

Ictero-anemia was first recognized and reported by Kinsley (1) in 1932, and later in the same year a report by Doyle (2) followed. This disease entity closely resembles bovine anaplasmosis, and for that reason it has also been termed an “anaplasmosis-like disease” of swine.

From its first observation some investigators have held the belief that ictero-anemia is an acute disease resulting from infection with a blood protozoan. This belief was supported by the observation of anaplasma-like or rickettsia-like bodies in blood smears from affected animals. Possibly some of the so-called anaplasma bodies were in fact Howell-Jolly bodies which are very numerous in the acute anemic stage of the disease and closely resemble Anaplasma. Doyle (2) and Dicke (3), however, described an organism of variable morphology consisting of coccoid, bacilliform, and ring-shaped structures. Doyle (4) later stated that the erythrocytic inclusions in typical ictero-anemia are more suggestive of Bartonella than Anaplasma, and for this reason he suggested the use of neoarsphenamine in treatment; neoarsphenamine being specific in certain Bartonella infections.

Other investigators have held the belief that the disease is not infectious, because of the very limited morbidity usually observed. Inability to reproduce the condition by experimental inoculation added support to this belief. Kinsley and Ray (5), Robb (6), Dykstra (7), et al. and others reported failure in attempts to reproduce the disease. Investigators have failed to note any relation between the state of nutrition and the occurrence of ictero-anemia. Harshfield (8), however, reports that it may be more frequent following nutritional anemia in baby pigs. In a recent survey (8) ictero-anemia was reported to have been diagnosed in the following states: California, Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, Nevada, North Dakota, Ohio, and South Dakota.

In recent studies (9, 10, 11) it was determined that an ictero-anemia of swine, occurring in the central United States, is in fact a transmissible, infectious disease, which results from an acute infection with a species of the genus Eperythrozoon. A rather complex disease problem is involved. At the present there is no evidence to indicate that more than one type of the typical ictero-anemia disease entity exists in swine in the United States.
THE GENUS EPERYTHROZOON

The Eperythrozoon is a pleomorphic, nonmotile, blood parasite which is most easily recognized and usually seen as a delicate ring structure located supracellularly upon the erythrocytes or extracellularly in the plasma. Such forms as cocci, rods, "tennis-racket", "dumb-bell", and others have been described. The organism may be detected microscopically by darkfield examination of blood or, preferably, by the examination of properly prepared blood films. There have been no reports of the artificial cultivation of any species of this genus. Whether these blood parasites should be classified as bacteria or protozoa is uncertain. A close relationship to Bartonella and Grahameella exists as well as certain close similarities to Anaplasma. The name of course implies the latter.

Eperythrozoa have previously been identified in several species of mice, the vole, a cat in South Africa (the Eperythrozoon species not established), sheep, and cattle. In general the various Eperythrozoon species are infectious for only one host animal, although in several species infections may be established experimentally in some closely related animals. These organisms have been found usually to be common blood parasites in their respective hosts, in the areas in which they have been identified.

No evidence has been presented, heretofore, which has incriminated an Eperythrozoon as causing a disease entity in naturally infected field cases. One possible exception may be the report by Clark (12) in 1942 who observed an Eperythrozoon infection in a cat. The organism was found associated with an acute and fatal anemia, no further observations are reported however. Neitz (13, 14) has stated that in cattle and sheep the possibility of eperythrozoonosis must be taken into consideration in cases of anemia and icterus. Neitz (13) found the post-mortem lesions of acute eperythrozoonosis in experimental sheep to be similar to those of anaplasmosis.

The author has described two new species of Eperythrozoon occurring in swine, *E. suis* which was first observed in field cases of ictero-anemia, and *E. parvum* which has been observed only under experimental conditions. The following authorities have concurred in the identity of these organisms as species of the genus Eperythrozoon: David Weinman, Yale University School of Medicine; W. O. Neitz, Onderstepoort Laboratory, Pretoria, South Africa; and Rue Jensen, Colorado A. & M. College. Animal inoculation studies served to differentiate these organisms from other known species. The presence of two separate species in swine was established by differences in the morphology and pathogenicity of the parasites, and by cross inoculation studies.

*E. suis* is a large parasite, apparently the largest Eperythrozoon known at present (15). The usual form observed is a ring structure about 0.8 microns in diameter, however ring and discoid forms may sometimes be seen with a diameter as great as 2.5 microns. Large ring forms may be of distorted shapes with an irregular distribution of the chromatin about the ring. Discoid forms appear as flat masses with the chromatin evenly distributed throughout.

*E. parvum* is a very small parasite which in this respect may readily be distinguished microscopically from *E. suis*. Differentiation is more difficult in mixed in-
Ictero-anemia of swine

Infections in which both parasites are sparsely distributed. Experimental results have indicated that *E. parvum* is nonpathogenic. In mixed infections *E. suis* has usually displaced *E. parvum.*

**PROCEDURE**

Following the observation of an Eperythrozoon parasite associated with cases of ictero-anemia, the author initiated studies to determine whether this organism is the etiologic agent of the disease. The techniques and methods of study used were those which have been used previously by the author and others in the experimental study of eperythrozoonosis, bartonellosis, and anaplasmosis of cattle and eperythrozoonosis of sheep.

Data was gathered from field cases in a manner so that observations could be made on the relationship of the Eperythrozoon infection to the course of the ictero-anemia disease entity. Detailed observations of these field outbreaks demonstrated immediately that probably all animals in the herd underwent Eperythrozoon infection. Subclinical symptoms of anemia and fever associated with relatively heavy parasitic attacks were found in some individuals in these herds. In many animals, however, light infections occurred with no observable symptoms whatever. Additional evidence of the widespread occurrence of the parasite was found during experimental studies. It was evident, therefore, that the observation of the parasite in affected animals could not be considered definitive proof the organism was responsible for the pathological processes observed. Reproduction of the disease experimentally enabled a comparison to be made of the disease process and pathology of experimental cases known to be caused by *E. suis* with the disease process and pathology of field cases thought to be due to *E. suis.*

Preliminary attempts to reproduce ictero-anemia experimentally were not successful. Normal swine inoculated with blood from field cases failed to develop any visible evidence of the disease, however a mild infection of *E. suis* did occur. This failure is in line with results previously reported by other investigators.

It is known concerning species of the genera *Eperythrozoon, Bartonella,* and *Anaplasma* that surgical removal of the spleen greatly reduces that individual's resistance to these blood parasites, and intense parasitic blood infections may take place in splenectomized animals. While it may be said that such animals are not normal, the ability to resist bacterial and viral infections is not lost, and such bodily processes as growth, leucocytic production, and capacity for erythrocytic regeneration continue at a relatively normal rate. The pathogenic effects of these blood organisms in heavy infections may thus be evaluated.

The experimental inoculation of splenectomized swine with citrated blood obtained from acute cases of ictero-anemia and recovered carriers resulted in heavy parasitic infections of *E. suis.* The degree of parasitic infection obtained equalled the intensity previously observed only in the early stages of ictero-anemia field cases. Intense parasitic infections were obtained also following the splenectomy of pigs already harboring *E. suis.* It was thus possible to study the effects which heavy infections of the parasite incurred upon the host, and to compare these with the infections observed in field cases. The course of the Eperythrozoon infection, the
resulting symptoms, disease process, and the lesions were identical in both field and experimental cases.

THE PATHOLOGY

Studies made on field and experimental animals established that the severity of the disease, following infection with *E. suis*, depends upon the intensity and duration of the resulting parasitic attack. The majority of normal swine are able to suppress the multiplication of *E. suis*, and consequently the parasite invasion is held to numbers insufficient to cause ill effects. Organisms then disappear microscopically from the blood and the animal remains a carrier, probably permanently. Pigs in which heavy parasitic infections develop show increased temperatures when the parasites become numerous. The fever has usually been directly related to the number of parasites present. In some cases the organisms may disappear spontaneously after being very numerous for a day or two. The pig may show no symptoms other than an elevation of the temperature during the parasitic attack and increased regenerative blood changes following the reduction in numbers and disappearance of the parasites. The anemia that develops may be negligible.

Pigs in which heavy infections persist develop symptoms of depression and anorexia (as well as fever) on the second or third day in which the parasites have been very numerous. Blood values begin to fall very rapidly, a decrease of as much as two million erythrocytes per day may be noted in the blood count. A spontaneous reduction in the number of parasites takes place as the anemia develops, and a corresponding decline in the temperature usually occurs. The animal becomes weak and gaunt, and exhibits anemic and usually icteric mucous membranes, dyspnea on forced exercise, and bile stained feces.

In splenectomized animals repeated parasitic relapses have occurred with each attack repeating the course of the disease as described, the severity of the attack depending upon the number and duration of the organisms. In experimental studies the time from experimental infection to the first appearance of symptoms has varied from 6 to 17 days. Parasites could be demonstrated in blood films from 2 to 7 days following intravenous inoculation of infectious blood. It is probable that the incubation period may be somewhat longer in naturally infected animals.

POST-MORTEM OBSERVATIONS

The post-mortem lesions in experimental cases have been identical to those of field cases. The blood appears thin and watery. Generalized icterus of variable intensity is usually present throughout the body fat and other tissues. The heart and kidneys appear pale and flabby. The gastrointestinal contents are deeply stained throughout with bile. The liver evidences degeneration and icterus, and the gall bladder contains a thick, gelatinous bile. There are, of course, no lesions of the spleen in splenectomized animals. The spleen in field cases is markedly enlarged to 2 or 3 times normal size, and is very soft and friable. Microscopically, the principal lesions have been observed in the liver, and consist primarily of damage and destruction to the central hepatic cells. Lymphocytic infiltration and hemosiderosis are also present.
ICTERO-ANEMIA OF SWINE

DIAGNOSIS

The possibility of eperythrozoonosis should be considered in all cases of anemia in swine. Icterus may or may not be present. Additional factors of value in reaching a diagnosis are the season of year, age of the animal, and usually low case morbidity. The post-mortem, anaplasmosis-like lesions are characteristic and, at the present, may be considered pathognomonic of the disease. Additional study is needed to determine whether any other agent may produce similar lesions in swine in this country.

The spontaneous agglutination of erythrocytes is quite constant in the acute anemic stage of eperythrozoonosis, and may be of some value in field diagnosis although probably not specific. This agglutination may be noted by placing a large drop of blood on a glass slide or by the observation of citrated blood samples. Within two or three minutes the blood becomes granular in appearance, and the granules settle rapidly to the bottom in tubes.

Field diagnosis may be far more difficult in cases observed in the early stages of the disease prior to the appearance of acute anemia. At this stage depression, anorexia, and fever of 104.0°F. to 107.0°F. may be the only symptoms. Experimental studies have shown that in some animals a sudden reduction of parasites may occur during these early symptoms; the animal almost immediately evidencing improvement. No symptoms may then be observable during the relatively mild anemic stage which follows. It is possible that individual cases of this nature may be relatively frequent in the field. Probably few of these cases would be called to the attention of a veterinarian because of the short duration of the illness, and probably still fewer would be correctly diagnosed.

The microscopic diagnosis of eperythrozoonosis requires that special attention be given to techniques and the interpretation of results. Diagnosis is complicated by the fact that during the acute anemic phase of the disease parasites may be very rare or entirely absent.

Blood films should be prepared directly from the living animal without the addition of an anticoagulant. E. suis undergoes rapid morphological changes in blood to which an anticoagulant has been added, and becomes difficult or impossible to identify. The most satisfactory and uniform staining results have been obtained with Giemsa stain. Because of the light staining characteristic of eperythrozoa, the correct staining procedures are of the utmost importance for their observation. A rather common tendency of laboratories is to use a slightly excessive acid solution so that the erythrocytes assume a reddish tinge. Eperythrozoa cannot be observed in such slides.

A positive microscopic diagnosis of Eperythrozoon infection, of course, does not mean necessarily that the animal is suffering acute infection. The history and symptomatology, the degree of parasitic infection, and the presence or absence of anemic changes in the blood film must be considered together in the correct interpretation of blood film examination. As a general rule it may be stated that in acute eperythrozoonosis parasites are very numerous early in the disease before anemic changes are noted in the blood film. When anemic changes are evident (as indicated by large numbers of immature erythrocytes) eperythrozoa become fewer in numbers and
increasingly difficult to observe. In negative microscopic findings in suspected cases a positive diagnosis requires the inoculation of blood into known susceptible, preferably splenectomized, pigs. As an alternative method splenectomy may be performed upon the suspected case after recovery to determine the presence or absence of latent Eperythrozoon infection.

**TREATMENT**

Neoarsphenamine has been found to produce a specific and prompt action against *E. suis* in experimental infections (16). Intravenous dosages varying from 15 to 45 mg/kg (0.68 to 2.0 grams per 100 pounds body weight) have completely eliminated or effectively reduced heavy parasitic infections. Clinical symptoms have been entirely relieved following the removal of parasites from pigs in the early stages of the disease. Several animals treated before the appearance of symptoms did not develop symptoms. Parasitic relapses occurred in all of the experimental cases whether initial attacks were treated or untreated. One field case in the early stages of the disease was treated and appeared to be normal, clinically, after 24 hours, however no conclusion can be drawn from this single case.

It appears that neoarsphenamine is of distinct value in acute infections of *E. suis*, however to be effective the drug must be administered early in the disease before severe anemia has developed and the parasites have largely disappeared spontaneously. This requires a very early and an immediate diagnosis, conditions which may not be possible in many cases. The direct relation between the degree of parasitic infection and increased body temperatures provides a rough measurement of the indications for specific therapy in known positive cases.

Drugs which have shown no value as specific agents when tested include: sodium cacodylate, antrycide, and piroplasmin. A drug is needed which may be administered easily to the entire herd, and which will effectively suppress infection in the incubative stages. Nonspecific therapy during the acute anemic stage is of some value in lowering the mortality. Good nursing and close confinement to prevent unnecessary exertion are of considerable importance. Hemopoietic drugs may also be of some value. Blood transfusions are indicated, but are probably not practicable except in rare instances.

**CONTROL**

The elimination of eperythrozoonosis by destroying the source of infection, the carrier, appears to be out of the question. In the first place these carriers are far too numerous. Experimental evidence indicates that the majority of adult swine in enzootic areas are carriers. Secondly a practicable method of detecting these carriers is not known at the present. Negative findings are obtained in the microscopic examination of carrier blood.

Control by elimination of the transmitting agents also appears, at present, to be impracticable. Although the exact methods of natural transmission have not been demonstrated, it may be said with certainty that transmission does not take place by direct contact between individuals but probably through the medium of insect vectors such as biting flies or mosquitoes. Susceptible splenectomized pigs in direct pen contact with pigs harboring *E. suis* have remained free of the parasite in the absence of insect vectors. Recent experimental attempts to transmit either *E. suis*
or *E. parvum* with hog lice (*Haematopinus suis*) from heavily infected pigs have not as yet been successful. Both mechanical and biological transmission attempts have been made.

Information is needed to reveal the bodily mechanisms involved which allow heavy Eperythrozoon infections to occur in some individual swine, while the majority successfully repress the multiplication of the parasite. Factors derived from external sources which lessen bodily resistance may be involved, or certain defects in the basic cytological and immunological defenses against this group of organisms may exist.

An increased prevalence of ictero-anemia following simultaneous vaccination for hog cholera has been noted by Quin (17), Spencer (18) and others. The possibility of dissemination of *E. suis* through the use of hog cholera virus blood was considered, but in a single experiment transmission was not obtained with heavily infected blood, phenolized and held 15 days under conditions identical to those of hog cholera virus blood.

In two hog cholera vaccination breaks apparently normal pigs in these herds were observed to be undergoing relatively heavy infections of *E. suis*. Evidence of subclinical anemia was also present. These infections may very well have been coincidental. On the other hand the lessened bodily resistance induced by the recent vaccination may have allowed heavier parasitic invasions to take place. This also may be the reason for an increased prevalence of ictero-anemia following vaccination. It is assumed these infections are acquired naturally and coincidently to the vaccination and not directly through the use of serum and virus. The exact relation of eperythrozoonosis to serum-virus vaccination certainly merits additional study.

It cannot be stated positively that acute eperythrozoonosis occurs only in initial parasitic attacks. It is possible that some cases may result from a recrudescence of a latent carrier infection. This may be true particularly in older animals, and in cases which occur during the winter months in the absence of active vectors. A possible example is a case of acute eperythrozoonosis observed in February of this year. A 300 pound gilt, eleven months of age was involved. Hog lice were present in this herd of six hogs, and may have served as vectors of the parasite or the attack may have been a recidivation from a carrier state. The seasonal occurrence of the majority of cases seems to indicate very limited, if any, transmission by hog lice.

**SUMMARY**

A disease entity of swine characterized by an acute hemolytic anemia and icterus has been found to be due to an acute parasitic infection with a blood parasite identified as *Eperythrozoon suis*. The disease entity produced by this parasite is identical to the condition of swine known as ictero-anemia or anaplasmosis-like disease. *E. suis* is a common blood parasite of swine in the enzootic area. The majority of young swine acquire infection during the summer months, and remain immune, latent, clinically unrecognizable carriers. The clinical disease depends upon the number of parasites which develop in the blood following infection, and the duration of their presence in large numbers. In the majority of swine light parasitic attacks take place and cause no visible damage. Heavier parasitic infections may
develop in some pigs and result in subclinical symptoms of fever and mild anemia. Heavy parasitic infections which are sufficiently prolonged result in depression, anorexia, and fever. Rapid blood cell destruction ensues together with a spontaneous reduction in the number of hematozoa. The temperature usually returns to normal or subnormal as the parasites disappear. The animal exhibits marked weakness, pale and often, icteric mucous membranes during the period of acute anemia. Death may occur in from one to five days or longer, following the appearance of clinical symptoms. Transmission is assumed to be by insect vectors. Neoarsphenamine exerts a specific parasiticidal action upon E. suis. Early treatment has a markedly beneficial effect upon the course of the disease. Specific therapy delayed until the acute anemic stage, can be expected to be of little or no value.

At the time this paper was prepared E. suis had been identified microscopically in 12 herd outbreaks of ictero-anemia in some 20 acutely affected swine. In addition subclinical symptoms have been observed in numerous animals in these herds associated with relatively heavy parasitic infections. Positive identifications of acute eperythrozoonosis have been made in Kansas, Iowa, and Missouri. It has been possible, thus far, to make positive microscopic identification in all cases of typical ictero-anemia in which blood films were prepared from living animals.

REFERENCES

REPORT OF COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE

L. M. Hutchings, Chairman; H. C. H. Kernkamp; J. D. Ray; H. U. Garrett; C. G. Cole; R. W. Elrod; B. H. Edgington; Hugh Cameron; and Roy Thompson

Your committee offers the following brief analysis of the current swine disease situation with some comments and recommendations.

HOG CHOLERA

Experience of the past two years most emphatically emphasizes again the importance of the oft repeated statement that hog cholera is still the most destructive disease in swine. In the fall of 1949 and again on October 3, 1950, the U. S. Bureau of Animal Industry issued official press releases relating to their finding of a “variant of hog cholera virus”. It is obvious to all that the results of more complete research studies must be awaited before the full importance and ramifications of this discovery can be spelled out and evaluated. However, until more complete information becomes available it seems of utmost importance for all veterinarians and swine raisers to recognize that the disease in question is still hog cholera, not some new mysterious disease. This is true regardless of the possible existence or prevalence or importance of a “variant” form of hog cholera virus.

The October 3, 1950, release mentioned above contains “two highly important recommendations by the Bureau” as follows: “(1) Vaccinate pigs before they are weaned. (2) Increase the amount of anti-hog-cholera serum used by roughly 50 per cent. With the regular virus inoculation the Bureau now recommends not less than 25 cc. of serum for suckling pigs; not less than 45 cc. of serum for weanling pigs up to 90 pounds; add \( \frac{1}{2} \) cc. of serum for each pound increase in liveweight for heavier hogs. If you are guessing the weight, don’t under estimate.”

This release also states: “Although spot losses have been heavy, the percentage loss country-wide has not been materially affected by the appearance of the variant. Any appreciable decrease in vaccination might well be followed by tremendous losses from uncontrolled spread of the disease itself. For this reason, the Bureau urges that farmers continue vaccinations with particular stress on early and heavy doses of anti-hog-cholera serum.”

Your committee feels that the Bureau should be commended for its research efforts with this problem and for the above timely and valuable recommendations.

Consideration has been and is being given to the possibility of a change in method and policy which would assure that the particular virus used in the production of the individual lot of anti-hog-cholera serum be distributed and used with such serum in the simultaneous method of immunizing hogs against cholera. Perhaps this would be an important and valuable aid if it can be accomplished in an economical, practical manner. Your committee recommends that this proposal be given thorough study and consideration. Even though it may add somewhat to the costs, perhaps such added costs would be far less in the production of pork than some current excessive death losses in vaccinated swine.
Your committee has noted increased sentiment and support for at least an attempt to change the method of controlling hog cholera to some method which would have promise of eventual eradication of the disease. As evidence of such sentiment the Executive Committee of the A.V.M.A. has on October 13, 1950, referred to this committee the following resolution on this subject:

"Whereas, hog cholera levies a cost of many millions of dollars annually on swine raisers of the United States, and

"Whereas, hog cholera, as shown by reports of the Canadian Health of Animals Division, by proper application of our own accumulated knowledge for its prevention and epizoology, can properly be considered an eradicable disease; therefore, be it

"RESOLVED: That the American Veterinary Medical Association endorses the formation of a committee representing all interested segments of the swine industry, including the A.V.M.A. the function and aim of this committee to be the integration and activation of a nation-wide campaign to eradicate hog cholera."

Such sentiment and support is coming from thoughtful and sincere veterinarians and swine raisers. Your committee considers these evidences of dissatisfaction with present methods as good, constructive criticism which should receive careful and sympathetic study and consideration.

ENTERIC DISEASES

It is becoming increasingly obvious that there is great need for more precise diagnoses particularly of the diseases and conditions that result in inflammations of the gastro-intestinal tract. We should no longer be satisfied with a diagnosis of "necro" or necrotic enteritis because it is known that such symptomatology and pathology results from multiple causes and in entirely separate disease entities. Your committee suggests that perhaps important progress in this direction would result from discarding these terms.

ANTIBIOTICS

We are definitely in the antibiotic era and these products do show some promise for the control of some diseases of swine, especially in the group of enteric diseases. But there is likewise evidence that there is danger that too much reliance may be placed on their use at the expense of not enough emphasis on differential diagnosis and sound control procedures.

ATROPHIC RHINITIS AND ICTERO-ANEMIA

There is evidence that these diseases are increasing in prevalence in the corn belt area and need to be given more attention and study particularly, at this time, because they are causing confusion in diagnosis.

"BABY PIG DISEASE"

It is becoming increasingly obvious from research that the term "Baby Pig Disease" includes more than one disease entity and thereby this term needs to be replaced with more precise diagnoses. Transmissible gastro-enteritis is one of the known specific infectious disease entities of new-born pigs. The evidence strongly
suggests that there are probably other infectious and non-infectious conditions yet to be adequately described which are currently being included in this group.

**BRUCELLOSIS**

Brucellosis continues as one of the important uncontrolled diseases of swine. Progress is being made. At least one state has adopted official plans for its control and eradication.

**MANGE AND EXTERNAL PARASITES**

The newer treatments for mange and other external parasites of swine are giving very satisfactory results, better than older methods.

**TRAFFIC IN SWINE**

There is great need for an effective means of limiting traffic in diseased swine. Your committee recommends that every effort be made to this end. There is frequent clear evidence that the most economically important swine disease such as hog cholera, swine dysentery, brucellosis, atrophic rhinitis and many others are spread from farm to farm mainly by traffic in infected and recently exposed swine.

**RESEARCH**

There is need for more and better research with swine diseases. It seems obvious that, through the years, the swine disease problems have not received an appropriate share of the public funds, state and Federal, which have been spent in agricultural research. Even superficial observation will confirm this when past expenditures are compared to the income from the swine industry. In the corn belt states the sale of swine accounts for about one-third of the total income of farmers. The cattle, sheep and poultry industries have effective state, regional and national organizations presenting their needs to the proper agencies. No such organizations have or are effectively directing attention of the Congress, State Legislature and Agricultural Experiment Stations to the needs of the swine industry for research on disease problems. Your committee suggests that no better service could be undertaken by this Association than steps designed to correct this deficiency.
REPORT OF COMMITTEE ON LAWS AND REGULATIONS

H. U. Garrett, Des Moines, Iowa, Chairman; T. C. Green, Charleston, West Virginia; M. O. Barnes, Olympia, Washington; I. G. Howe, Albany, New York; J. V. Knapp, Tallahassee, Florida; J. T. Schwab, Madison, Wisconsin; J. F. Cavanaugh, Columbus, Ohio; G. H. Good, Cheyenne, Wyoming; Lee Davisson, Lansing, Michigan; H. F. Wilkins, Helena, Montana.

Last year at the meeting of the United States Livestock Sanitary Association at Columbus, Ohio, our Committee on Rules and Regulations presented a new approach to a more understandable regulation by presenting what we chose to call a compilation of Maximum Requirements with the recommendation that it be referred to the Executive Committee for adoption.

Considerable discussion was entered into from the floor of the Assembly, with the result that the report of the Committee was tabled until the next meeting.

After searching the files of the proceedings of this assembly, and having received many favorable comments, from representatives of Breed Associations, individuals and sanitary officials, it was decided the approach of our Committee last year still had merit and was worthy of renewed consideration.

Many efforts have been made to write a regulation that would be uniformly adopted, but it has met with very little success. This, of course, is partly due to the varied problems of the different states.

During the past year, sectional meetings between the states have been held, and have given promise of better understanding and closer cooperation than has been practiced in the past.

The adoption of the report of our Committee as presented last year, which many of you have had an opportunity to study throughout the year, would change the regulations of no state, but would make for a more simplified form to be presented to the practicing veterinarian and livestock industry.

The compilation of Maximum Requirements would be printed in the preface of Circular #1 which is prepared by this Association as a guide for the livestock producer informing him of the manner in which livestock so prepared could enter any state in the Union.

Listed under each state in the Circular #1 would be the deviations, all of which would be downward. The Secretary of this Association would forward a copy of the Maximum Requirements to the sanitary official of each State, who would write his regulations, hereinafter called deviations, according to his State’s requirements, and return them to the office of the Secretary for publication. We feel this arrangement would be more understandable and would allow the livestock breeders to so prepare his animals that they would be eligible to enter any state. This would reduce the size of this publication from its present 342 pages to approximately 75, reducing the cost to a sufficient level that would permit wider distribution to livestock owners by sanitary officials of each State.

Under our present system, forty-eight separate regulations are written; forty-eight interpretations are necessary for the shipments of livestock in our nation.
Uniformity of regulations would only exceed the proposed plan if they were adopted verbatim.

This Committee recommends that Circular #1 be brought up to date and published annually.

We, the Committee on Rules and Regulations, submit this report to the Executive Committee for consideration.

**Compilation of Maximum Requirements**

**Section I—General**

A. No animal, including poultry or birds of any species, that is affected with or that has recently been exposed to, any infectious, contagious, or communicable disease or originates from a quarantined area, shall be imported into the state until written permission for such importation is obtained from the livestock sanitary official of the state of destination.

B. A copy of the approved official health certificate shall be forwarded to the livestock sanitary official of the state of destination before the arrival of the livestock.

C. All livestock imported into the state shall be accompanied by an official health certificate or permit which must be attached to the waybill or shall be in the possession of the driver of the vehicle or person in charge of livestock.

D. Requirements for the exhibition of livestock may be secured by contacting the livestock sanitary official of the state in which the animals are to be exhibited.

E. All animals covered by these regulations originating from public stock yards or which may be assembled at public stock yards from any sources of unknown origin shall be required to meet regulations of state of destination before being released.

F. Livestock entering the state without a proper health certificate, or a permit shall be held in quarantine at owner's expense until released by the livestock sanitary official.

G. WHO MAY INSPECT: Accredited, licensed graduate veterinarians who are approved by the livestock sanitary official of the state of origin and veterinarians in the employ of the United States Bureau of Animal Industry.

H. WHO MAY APPROVE: All health certificates shall be approved by the livestock sanitary official of the state of origin.

**Section II—Official Health Certificate**

A. An official health certificate is a legible record covering the requirements of the state of destination, accomplished on an official form from the state of origin and approved by the livestock sanitary official of the state of origin and issued by a licensed, graduate, accredited veterinarian who is approved by the proper livestock sanitary official of the state of origin.

B. The health certificate shall contain the names of and addresses of the consignor and the consignee, with an accurate description or identification of the
livestock and shall also indicate the health status of the animals involved including results of required tests as well as dates and vaccination, if any. Health certificates shall be void thirty (30) days after issuance.

C. All agglutination tests for brucellosis which are intended for interstate movement shall be made in the state or federal laboratory.

Section III—Permits

A. Requests for special permits must be directed to the livestock sanitary official of the state of destination, giving such information as number and kind of animals, origin of shipment and the proposed destination.

B. All animals entering the state under special permit shall be consigned to a definite legal resident.

C. All special permits are void fifteen (15) days after date of issue.

Section IV—Owners and Operators

A. Owners and operators of common carriers, trucks and other conveyances are forbidden to move any livestock into or within the state or through the state except in compliance with the provisions set forth in these regulations.

B. All railway cars, trucks and other conveyances used for the transportation of livestock and poultry shall be maintained in a sanitary condition.

C. Owners and operators of railway cars, trucks and other conveyances that have been used for the movement of any livestock infected with or exposed to any infectious, contagious or communicable disease shall be required to have such cars, trucks and other conveyances thoroughly cleaned and disinfected under official supervision, before further use is permissible for the transportation of livestock.

LIVESTOCK

(General Rules under Sections I, II, III and IV apply to all subsequent sections)

Section V—Cattle

Tuberculosis

a. Cattle for dairy and breeding purposes may enter the state if they originate in an accredited herd and have been tested within the last twelve (12) months.

b. Or if they are identified as originating in qualified negative herds, in modified accredited free areas and the last herd test of which was made within the previous twelve (12) months and the individual has passed an additional test for tuberculosis within thirty (30) days prior to shipment.

Brucellosis

a. Herds officially certified brucellosis-free or qualified herds in certified brucellosis-free areas, in which all animals, except steers, in the herd over six (6) months of age were negative to an official test for brucellosis within twelve (12) months of entry and the animals for entry were negative to an official blood test within thirty (30) days of the date of entry.
b. Herds under federal-state supervision for the control of brucellosis in which all animals in the herd over six (6) months of age were negative to an official blood test within three (3) months of entry and the animals for entry were negative to an official blood test within thirty (30) days of entry—such test not to be applied within thirty (30) days of date of the previous herd test.

c. Cattle under eighteen (18) months of age vaccinated by a veterinarian under federal-state supervision with Brucella abortus vaccine between six (6) and eight (8) months of age, which originate in herds in accordance with paragraphs (a) and (b) may be imported into any state if not negative or without an official blood test, but the importation shall be at the request of the purchaser and subject to the approval and special written permit issued by the livestock sanitary official of the state of destination.

**Steers:** No tuberculin test required.

d. Cattle vaccinated under federal-state supervision with Brucella abortus vaccine or any other biologic approved by the Bureau of Animal Industry, between six (6) and eight (8) months of age and have been properly identified and reported to the livestock sanitary official of the state of origin, are eligible for interstate movement up to one (1) year following date of vaccination, without an agglutination test, provided they are accompanied by an official health certificate which has been approved by the livestock sanitary official of the state of origin and a permit granted by the livestock sanitary official of the state of destination.

e. Unvaccinated calves under six (6) months of age will not be required to be blood tested prior to entry, provided they are identified as the progeny and come directly from negative or brucellosis-free herds.

**Feeder Steers:**
a. Steers may enter the state for feeding and grazing purposes when accompanied by a special permit and an official health certificate, indicating they have passed a negative test for tuberculosis and are free from all contagious and infectious diseases, provided they are maintained separate and apart from all dairy and breeding cattle.

**Scabies:** No cattle affected with or exposed to scabies shall be shipped, trailed, driven or otherwise imported into another state for any purpose.

**Immediate Slaughter:** Cattle for immediate slaughter, consigned to a recognized slaughtering center or public stock yard where federal inspection is maintained, may enter the state without a health certificate or a negative test for tuberculosis and brucellosis and shall be considered as under quarantine until slaughtered.

**Section VI—Dogs**

All dogs imported into the state for any purpose shall be accompanied by a certificate of health stating that the animal is free from all infectious diseases and did not originate within an area under quarantine for rabies and has not been exposed to such disease; also that the dog has been immunized against rabies not less than thirty (30) days, nor more than six (6) months prior to shipment.
Section VII—Goats

Goats for dairy and breeding purposes may enter the state provided they are accompanied by a certificate of health showing a negative test for tuberculosis and come from a brucellosis-free herd and negative to the agglutination test within thirty (30) days of date of entry. The health certificate shall contain a full description of each animal giving age, color and markings.

Immediate Slaughter: Apparently healthy goats may be imported into the state when consigned directly to a recognized public stock yard or a slaughtering establishment or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture and the livestock sanitary official of the state of destination.

Section VIII—Horses, Mules and Asses

These animals may be imported into the state when accompanied by an official health certificate.

Section IX—Poultry

Chickens, turkeys or other poultry over five (5) months of age intended for breeding purposes shall not be imported into the state unless they have passed a standard intradermic tuberculin test and a negative agglutination test for pullorum disease under the supervision of the livestock sanitary official within thirty (30) days preceding date of importation or have originated from flocks authoritatively participating in such pullorum control and eradication phase of the National Poultry Improvement Plan or National Turkey Improvement Plan as may be adopted in state of origin.

Section X—Sheep

A. All sheep entering the state for purposes other than immediate slaughter shall be accompanied by a certificate of health indicating they are free from scabies and exposure to all infectious and transmissible diseases and that they have been dipped twice in accordance with the regulations of the Bureau of Animal Industry, United States Department of Agriculture, within fifteen (15) days prior to entry into the state.

B. Permit—Feeder Lambs: Lambs may be imported into the state for feeding purposes, provided they are accompanied by a certificate of health, indicating they have been dipped in accordance with the regulations of the Bureau of Animal Industry and a special permit is secured before shipment from the livestock sanitary official of the state of destination.

C. Immediate Slaughter: Apparently healthy sheep may be imported into the state when consigned directly to a recognized public stock yard or a slaughtering establishment or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture and the livestock sanitary official of the state of destination.
Section XI—Swine

A. All swine imported into the state except for immediate slaughter, shall be accompanied by a health certificate, stating that each animal has been vaccinated with anti-hog cholera serum and virus not less than thirty (30) days immediately prior to date of entry and originates in a brucellosis-free herd and are negative to the agglutination test within thirty (30) days of date of entry. All dates to be marked plainly on the health certificate. A copy of the certificate of health shall accompany the swine while enroute.

B. Feeding Purposes: Swine for feeding purposes may enter the state providing they are accompanied by a health certificate indicating they have been vaccinated with anti-hog cholera serum and virus, thirty (30) days prior to date of entry and are free from infectious or contagious diseases.

C. Immediate Slaughter: Swine may be imported for immediate slaughter without a health certificate, provided they are consigned directly to a recognized public stock yard or to a slaughtering establishment or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture, or the livestock sanitary official of the state of destination.

IOWA

(This is a sample of the deviations which will appear in Circular #1 under Iowa)

Section V—Cattle

Tuberculosis: 30 day test acceptable.
Brucellosis: 30 day test acceptable.
Vaccinates: Acceptable up to 18 months following date of vaccination.
Feeders: Female range or semi-range cattle of recognized beef type under 18 months of age may enter the State for feeding or grazing purposes, under quarantine for a period not to exceed 12 months from date of entry, provided they are accompanied by a special permit and official health certificate. Such cattle to be maintained separate and apart from all other cattle on the premise.
Steers: No tuberculin test required.

Section VI—Dogs
No requirements that dogs must have been immunized with rabies vaccine over thirty days.
No requirements on performing dogs which are to be within the state for a limited time.

Section VIII—Horses, Mules and Asses
No health certificate will be required for horses or mules owned by the United States Government or horses which are consigned to any race track or entering the state temporarily for exhibition.

Section IX—Poultry
No regulations, except for fairs and exhibition.
Section X—Sheep

Sheep must be accompanied by a certificate of health stating they are free from all infectious diseases and that they have been dipped in a recognized dip within 10 days prior to entry, or a special permit must be secured from the Iowa Department of Agriculture to enter, subject to quarantine regulations.

Section XI—Swine

No test for brucellosis required. Permit may be secured for entry, subject to vaccination at destination.
REPORT OF REPRESENTATIVE TO THE THIRTY-SECOND ANNUAL CONVENTION OF NATIONAL ASSOCIATION OF COMMISSIONERS, SECRETARIES AND DIRECTORS OF AGRICULTURE

R. A. HENDERSHOTT, D.V.M.

Trenton, New Jersey

Gentlemen:

It was my privilege along with Doctors H. U. Garrett of Iowa and E. P. Anderson of Nebraska to represent our Association at the 32nd Annual Meeting of the National Association of Commissioners, Secretaries and Directors of Agriculture, some forty members of which met at the Hotel Abraham Lincoln, Springfield, Illinois on September 17 to 21, this year.

At the outset I should state that one attending this meeting gains the impression that the principle object is to get acquainted with one another, exchange views, learn something about agriculture in the area visited, observe research as applied to farming and to very seriously devote time to the two major subjects of interest, namely, animal industry and its problems and the problems of marketing agricultural products. The principle speakers on the program dealt with the economic situation both agricultural and world wide, as well as marketing.

This group is seriously concerned about many of the problems with which we are concerned such as interstate health requirements and disease control and eradication. They have set up the following committees:

2. Constitution and By-Laws—eight members.
3. History—seven members.
4. Marketing—twenty-one members.
5. Plant Industry—thirteen members.
6. Program—seven members.
7. Public Relations—eleven members.
8. Resolutions—fifteen members.
9. Transportation—thirteen members.
10. Nominating—five members.

They also divide the Country into four regions: the North Central Region, North East Region, Southern Region and Western Region. These four regions hold at least one meeting each year and each region makes a report at the Annual Convention. At these regional meetings problems common to the states of the region are discussed and tours to farms or plants where modern methods are being employed are observed. Regional reports to the Annual Convention provides a means of informing all of the members relative to the advances being made throughout the nation.

298
REPORT OF THE COMMITTEE ON PUBLIC RELATIONS


Mr. Chairman and gentlemen, in reporting the activity of your Committee on Public Relations it should be stated that we have had excellent radio coverage. A number of broadcasts and recordings have been made since this fifty-fourth annual meeting was convened on Wednesday. Among those contributing time to this program were Dr. Tarlitzis of Greece, Dr. Malaga of Peru, Dr. Willers of Hawaii, Dr. Wilkins of Montana and your reporter. We have had good coverage in the newspapers. Each day there have been pictures of various groups and individuals, with extracts from several papers. The newspaper men, you know, pick out the material they want, and they do a pretty good job. Sometimes what they choose to print we might not perhaps think is quite as essential to the industry, but they have to have something that will cause their readers to read their paper. I believe the papers have all been gone over by these men, and they have given us very good coverage.

For the record I want to say that on behalf of this Association I wish to extend to Dr. McMahon and the individuals whom he has had help us in this work, a good vote of thanks. We prearranged with him to have the physical plant set up so that we could take care of this work and he went even farther than that: He brought in an outside lady to make all the arrangements with the radio people, with the newspaper men and with a little advice and counsel from your Chairman on Publicity she arranged all of this work. She did a wonderful job and gave us splendid cooperation. Last year in Columbus, you will remember, Dr. Geyer did the same thing.

We are getting into our stride in this public relations work. It is something new, having been set up in Denver and each year we seem to get new ideas and branch out a little more. After we strike two or three more cities we probably will be in high gear.
MEETING OF NATIONAL ASSOCIATION

Tours are always a part of these meetings both regional and national and afford ample opportunity for those attending to become intimately acquainted with one another and to exchange viewpoints on subjects of importance to the agriculture of the nation.

At the 32nd Annual Convention four panel discussions were scheduled: the first on Animal Industry, second on Problems in Marketing and Inspection, third on Problems of Plant Pest Control, the fourth on Transportation Rates and Their Effect on Agriculture. One afternoon is devoted to the meeting of the various committees and a half day to their presentation, discussion and adoption by the convention. The Panel on Animal Industry was entitled "Problems in Livestock Disease Control". The Moderator was Honorable Rufus Howard, Director of Agriculture of Nebraska. Members of the panel included: Dr. B. T. Simms, Chief, Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C.; Dr. R. A. Hendershott, Secretary United States Livestock Sanitary Association, New Jersey; Dr. H. U. Garrett, President National Assembly, Chief Livestock Sanitary Official, Iowa; Paul W. Swisher, Commissioner of Agriculture, Denver, Colorado; Perley I. Fitts, Commissioner of Agriculture, New Hampshire. Edward Jones, Commissioner of Agriculture, Tennessee.

Dr. Simms was asked to bring us up to date on the Foot-and-Mouth Disease situation in Mexico and also to speak on the status of the Foot-and-Mouth Laboratory on Prudence Island. He also was asked about the status of M. Vaccine. Dr. H. U. Garrett presented some of the problems of livestock disease control in Iowa and talked about the Uniform Interstate Health Requirements.

Mr. Swisher related Colorado's recent experience with the introduction of sheep scab and deplored the apparent lack of reporting of the occurrence of infectious diseases in the various states and the critical need for rapid dissemination of such information to all states. He also spoke at length about the need for a more adequate program for control over the interstate transportation of livestock by truck.

Commissioner Jones presented the problem created in certain states by the demand for the retesting of all cattle in a tuberculosis accredited area pointing out the dearth of veterinarians in certain areas to carry out such a program even if money was available to do the retesting.

Commissioner Fitts of New Hampshire devoted his time to a review of the pullorum disease eradication project in his State and cited examples of breaks resulting from a relaxing of effort upon the part of some farmers to follow time tested disease control practices and good management. He also spoke on the great progress and accomplishment attained in eradicating brucellosis and made the point that disease eradication was still based upon the removal to slaughter those animals found to be reactors.

It was my privilege to endeavor in the few minutes remaining to sum up and touch upon some of the questions presented by the previous speakers. Talking on the plight of certain states created by the problem of tuberculosis I pointed out that some states were finding on retest of their herds that it was important that we be stirred out of our complacency with regard to tuberculosis. It was also pointed out that over the years there has been a pretty free exchange of cattle based upon
accreditation established years ago. The opinion was expressed that more of the commissioners should enter into the deliberations of the meeting of our committees on tuberculosis and brucellosis so the committee members would have the viewpoint of the various commissioners and I invited the Association of Commissioners, Directors and Secretaries of Agriculture to appoint a Committee of their Organization to officially represent them at our meeting while extending an invitation to all of them to attend.

With regard to the control over the truck movement of livestock it was pointed out that many of the states had a state constabulary and that if in those states there was sincere interest in the control over truck shipments of stock that one might work out a cooperative program with the state police that would really accomplish the purpose. I thanked the Association for the fine spirit of cooperation and understanding that existed between our respective organizations and asked them to be with us here in Phoenix for our Fifty-fourth Annual Meeting.
REPORT OF THE COMMITTEE ON LEGISLATION

T. C. Green, Charleston, West Virginia, Chairman; R. A. Hendershott, Trenton, New Jersey; H. E. Curry, Jefferson City, Missouri; B. T. Simms, Washington, D. C.; J. S. Barber, Providence, Rhode Island; F. E. Mollin, Denver, Colorado; Joe Montague, Fort Worth, Texas; Warren B. Earl, Reno, Nevada.

Dr. Green: Mr. Chairman, your Committee on Legislation, after discussing a number of subjects which apparently should come before this Association, decided that among those subjects the only one to come before the Legislative Committee at this time is Senate Bill 2188. Therefore, we report as follows:

"The Committee gave further consideration to Senate Bill 2188 which failed passage in the recent session of Congress.

"Inasmuch as there appears to be little, if any, possibility that there can be action on such legislation until next year, with the new Congress, it is our recommendation that our officials be directed to confer with the officials of the United States Bureau of Animal Industry and representative livestock officials in the City of Washington, D. C. next year, in an effort to work out a new bill in lieu of Senate Bill 2188, which would be satisfactory to all of these interests."
REPORT OF COMMITTEE ON RESOLUTIONS

F. E. MOLLIN, Colorado, Chairman; D. M. CAMPBELL, Illinois; A. L. BRUECKNER, Maryland; E. P. ANDERSON, Nebraska; H. J. ROLLINS, North Carolina; A. G. PICKETT, Kansas.

RESOLUTION 1

Be It Resolved: That the United States Livestock Sanitary Association convey its sincere thanks and appreciation to each speaker on the program, and to each member of the several committees, for their services in the preparation and presentation of the program of this the 54th Annual Meeting of this Association.

RESOLUTION 2
(Foot and Mouth Disease)

Resolved: That we commend the proposal of the Food and Agricultural Organization of the United Nations and the International Office of Epizootics to establish an international center for the study of the virus of Foot-and-Mouth disease, its immunological classification, maintenance of strains, experimental methods, epizootiology, methods of control and production of tissue vaccines.

RESOLUTION 3
(Virus Investigation)

WHEREAS, virus diseases are rapidly assuming the position of first importance among the destructive diseases of farm animals and poultry in our country, and

WHEREAS, less is known of the nature of filterable viruses than of the nature of any other group of pathogens of livestock, and

WHEREAS, with the information at present available the control and eradication of virus diseases, as a group, is fraught with greater complexity and more nearly insurmountable difficulties than characterize any other group of diseases; therefore, be it

Resolved: That the U. S. Livestock Sanitary Association petition the Congress of the United States and the Secretary of the United States Department of Agriculture to provide and establish, without delay, a Virus Division within the Bureau of Animal Industry, United States Department of Agriculture, with adequate personnel, laboratory equipment and other facilities to conduct fundamental research into the nature of viruses, and to explore the possibilities of the development of prophylactic and curative agents for diseases of animals caused by viruses and Rickettsia; and be it further

Resolved: That we express as our considered judgment that, at the present time, virus diseases pose the greatest potential threat to our indispensable livestock industry; and also that these diseases offer the most feasible instrument of attack, in case of national emergency, by enemy agents and saboteurs who may attempt to handicap the defense of this country by striking at essential food supplies.

302
RESOLUTION 4
(Control Over Biologic Products)

Be It Resolved: That the United States Livestock Sanitary Association petition the Congress of the United States to amend the livestock disease control laws to authorize the Secretary of the United States Department of Agriculture to promulgate rules and regulations requiring manufacturers and distributors of serums, vaccines, viruses and toxins, to render concurrent reports to the chief livestock sanitary official of the state of destination of all sales and distribution of the products herein mentioned.

- Ovine ecthyma vaccine
- Tuberculin
- Products made from brucella organisms
- Hog cholera virus
- Swine erysipelas culture vaccine
- Newcastle vaccines containing live virus
- Laryngotracheitis vaccine
- Anthrax spore vaccine

RESOLUTION 5
(Rabies Control)

Be It Resolved: That the United States Livestock Sanitary Association petition the Secretary of Agriculture of the United States to secure from the Congress authorization for the Bureau of Animal Industry to take its rightful place in rabies control on a national basis with the U. S. Health Service and the Fish and Wildlife Service in cooperation with state agencies and to provide funds for the prosecution of the duties so imposed.

RESOLUTION 6
(Diagnostic Laboratories)

Whereas, hardly anything is more important in prevention control eradication and treatment of the infectious and nutritional ailments of animals than accurate diagnosis, and

Whereas, the subtleties and vagaries of many ailments are such that laboratory examination is desirable or essential to their early, definite and accurate diagnosis, and

Whereas, there are a number of excellent college, state agricultural experiment station and private laboratories already rendering high class diagnostic services to veterinary practitioners, there are still many sections of the country in which such services are not readily available to practitioners or the official livestock sanitary personnel.

Therefore, Be It Resolved: That we urge our members to lend their support to the establishment of public diagnostic laboratories in sections where needed to the end all engaged in combating the diseases of livestock, whether in a public or private capacity, may have readily available at all times an adequate diagnostic laboratory service.
RESOLUTION 7
(On Assembling Morbidity and Mortality Statistics)

Whereas, initial reporting of animal morbidity and mortality must begin with the veterinary practitioner, public health officer and other professional persons and organizations at the county level, and

Whereas, these reports will be assembled at the office of the state veterinarian,

Therefore, Be It Resolved: That this Committee on Morbidity and Vital Statistics of this Association be authorized to approach state veterinarians and ask their early participation in a program of collecting and assembling morbidity and mortality data under their direction within their respective states.

RESOLUTION 8
(Agencies To Assemble and Disseminate Statistics)

Whereas, the WHO will be dependent upon a national agency as a source of animal morbidity and mortality data,

Therefore, Be It Resolved: That this Association continue to urge the establishment of a national system of reporting morbidity and mortality statistics of livestock and recommend that the Bureau of Animal Industry and Bureau of Agricultural Economics be designated as the official agencies for the assembling, classifying and publication of the information, and

Be It Further Resolved: That the support of this organization in the collection of veterinary vital statistics at the county and state levels is hereby pledged, and

Be It Further Resolved: That the good offices of the Secretary, United States Department of Agriculture, is hereby solicited in procuring any Congressional authority which may be necessary to effect the objects of these resolutions.

RESOLUTION 9
(On The Inspection Of Ready To Cook Poultry)

Whereas, the U. S. Department of Agriculture, Poultry Marketing Administration regulations with respect to poultry grading and inspection do at the present time have a number of confusing and contradictory points included, and

Whereas, 'Ready-to-cook' poultry that has been graded but not governmentally inspected might lead consumers to purchase a nice appearing but diseased bird, and

Whereas, the U. S. Livestock Sanitary Association is fully cognizant of the implications with regard to ineffectual poultry disease control efforts upon the use of unqualified, poorly supervised inspectors, and

Whereas, this Association desires to take cognizance and commend the activities of the Poultry Inspection Service, which has long provided the poultry industry and consumers with an efficient, economic and adequate plan of poultry meat inspection for wholesomeness; now, therefore, be it

Resolved: That the U. S. Livestock Sanitary Association, in convention assembled at Phoenix, Arizona, this 2nd day of November, 1950, urgently requests the Poultry Marketing Administration of the U. S. Department of Agriculture to prohibit the grade labeling of 'ready-to-cook' poultry unless such poultry has been inspected by
RESOLUTIONS

qualified, properly trained, properly supervised inspectors who are civil servants and, therefore, responsible primarily to the consumer.

RESOLUTION 10

Be It Resolved: That we commend our fellow member, Dr. F. D. McMahon, the Phoenix Convention Bureau, the ladies auxiliary of the Valley Veterinary Medical Association, and the other Committees who contributed their help and assistance in making local arrangements, necessary for the success of this the Fifty-fourth annual meeting of the Association.

RESOLUTION 11

Be It Resolved: That we extend our thanks and appreciation to the management and employees of the Westward Ho Hotel for the satisfactory accommodations provided, and for the many courtesies extended to our members and visitors.

RESOLUTION 12

Be It Resolved: That the Secretary-Treasurer of this Association be authorized and instructed to supply copies of the foregoing resolutions to the appropriate persons, and by letter, direct their attention to these resolutions.
REPORT OF THE COMMITTEE ON POLICY


Your Committee on Policy begs to submit the following recommendations:

1. We recommend that the constitution and by-laws be amended so that the election of officers of this organization can take place during the first and not later than the second day of the meeting.

2. We recommend that the programs be studied to the end, that the most vital questions be presented in time so that the Executive Board may take action before its last meeting.

3. Your Committee recommends that district livestock sanitary associations be organized.

4. We recommend that a new committee be appointed to be known as the "Committee on Transmissible Diseases", the duty of this committee being to report on such transmissible diseases of importance as do not come under the jurisdiction of already appointed committees. We refer to such diseases as X Disease, Q Fever, Listerellosis, Leptospirosis, etc.

5. Your Committee recommends that the Executive Board consider the advisability of extending the time spent at our meeting by adding an additional day, making the meeting cover 3 1/2 to 4 days instead of 2 1/2 to 3 days.

6. It is the belief of your Committee on Policy that study should be made of the various committees and any that are of little or no importance should be deleted and other new committees appointed from time to time as the need may arise.

7. We recommend that the Committee on Policy be deleted from the committees of this Association and that any question on policy be submitted directly to the Executive Committee.
Mr. Willoughby requested permission to address the meeting. The request was granted.

**MR. RAY WILLOUGHBY (Texas):** Ladies and gentlemen, I am a little new at this. There have been some matters called to my attention that I think are well worth while bringing up at this time, and if you will bear with me for just a minute I will ask the Chairman to bear with me too, for just half a second.

The reason I arise and ask for recognition at this time is for the purpose of making a privileged motion, one that is authorized by specific provision in the By-laws of this Association. I want you to understand, gentlemen, that I am a producer. I represent several producer organizations, and have authority to speak for them at this time.

Mr. Chairman and members of this Association, the By-laws of this organization have a provision setting up the regular order of business that is to be followed by the Association when assembled in convention. Of course, you are all familiar with that order of business. But there also is a provision in the same section of the By-laws, setting up the manner in which the order of business may be suspended or changed, and it is under this last section of the By-laws that I wish to make my motion.

Mr. Chairman, I move that the regular order of business now be suspended, and that I, one of your members, be recognized by the Chair for the purpose of offering a motion relating to the Constitution and By-laws of this Association.

**CHAIRMAN MOLLIN:** Is there a second to the motion? (The motion was severally seconded.)

**CHAIRMAN MOLLIN:** It requires a two-thirds vote of those present to take up this matter out of the regular order of business. When you vote on this motion you are not voting on a change in the By-laws—you are merely voting on the opportunity to present a motion that will deal with the change in the By-laws. It is a preliminary motion, just to put the matter before the house out of the regular order.

We will take a standing vote, gentlemen.

**MR. WILLOUGHBY:** Is it clear what we are voting on? You are simply voting on whether or not I shall have the privilege of presenting this motion. (The motion was put to a standing vote and was carried unanimously.)

**MR. WILLOUGHBY:** Thank you, sir. Now, Mr. Chairman, I wish to speak to that motion for just half a moment.

Mr. Chairman and gentlemen of the convention, since my motion has been duly made and seconded, I desire to speak on the matter very briefly.

The Constitution and By-laws are one instrument in this organization, and I say to you that I am sure this organization has the most unique setup in this regard that exists in this country.

I wonder if you members of this organization realize that actually you are assembling in convention, and it doesn't mean a thing. My reason for saying that is that underneath these peculiar By-laws you have no right even to vote on a ques-
tion of the policy or the principles that this Association shall follow or subscribe to as an organization.

Under the strange By-laws now controlling this organization, all matters of policy are exclusively controlled by the Executive Committee, and even any action taken by you in convention relating to policy or principles may be vetoed by the Executive Committee, which Executive Committee is not elected by you nor is its personnel necessarily members of this organization.

Committee reports are referred to the Executive Committee by the convention; but even those committee reports, after passing the committee and after approval by the convention—by the members—may be nullified and vetoed by the Executive Committee.

There are other peculiarities in the By-laws, but the one pointed out should be sufficient to prove to you that these By-laws need amendment.

Surely you who are dues-paying members should have some voice in determining the policies of this Association. Surely you, who are the Association, should be represented on the Executive Committee. Therefore, I hope you will adopt a motion made by me for the purpose of allowing, out of regular order, the motion relating to these By-laws.

That is my motion, Mr. Chairman.

DR. A. K. CARR (California): I know that this matter came before the Association last year, and it created quite a discussion on the floor. The question of proper representation of the members of the Association came up last year. I don't think we necessarily have to go into that matter again, because you have suspended the order of business, and by a vote of those present you wish to have this Association go through with a study of the By-laws to see whether or not some review is necessary.

In view of that, I wish to make a motion. I move that the Chairman appoint a committee, with instructions to study the By-laws of this Association, and that this committee report back to this convention such amendments, recommendations, as that committee deems proper to be reported. (The motion was severally seconded.)

CHAIRMAN MOLLIN: You understand that even then any changes proposed have to be submitted to the Executive Committee, and then have to be carried over to next year's convention to be ratified. Isn't that correct, Doctor?

SECRETARY HENDERSHOTT: They should have been presented in writing to this convention.

CHAIRMAN MOLLIN: They will be, if this committee reports. The committee will report in writing to this convention, and I presume the regular course of business under the rules would be to submit it to the Executive Committee. That is proposed. The Executive Committee's action, if they approve, will permit it to be taken up for final disposition at the next convention.

The only reason for bringing this up as a special order of business is that otherwise it would take two years to amend the By-laws, instead of one year. By submitting it to this convention at this time you could act on it next year.

I would like to suggest that, if this motion carries and a committee is appointed, the committee also should consider the recommendation made by Dr. Brandenburg, which I think also dealt with a proposed amendment to the By-laws.
Are you ready for the question?

Dr. Smith: When will this committee report back?

Chairman Mollin: The last afternoon, at the business session.

Dr. Smith: That is a little late for the Executive Committee to give consideration.

Chairman Mollin: Does the Executive Board or the Executive Committee have to give it consideration at this meeting, Doctor? Could they give it consideration during the year, and report back at the next meeting? It has to be referred to and be approved by the Executive Committee, and cannot be adopted for a year.

Dr. Smith: That is true, but it is not entirely clear. I am not objecting to a study of it—I think it is a good thing; but the committee you are going to appoint—

Chairman Mollin: —will report back the day after tomorrow.

Dr. Smith: Then you do not expect the Executive Committee to take any action?

Chairman Mollin: As I see it, it doesn't make any particular difference whether they take action now, or carry it over until their first meeting next year. What do you think, Dr. Hendershott?

Secretary Hendershott: It will give us a year to study it.

Chairman Mollin: Then it could be brought back before the convention at the next meeting. It could not be acted upon finally, Dr. Smith. It has to carry over for one year, according to the By-laws.

Dr. Smith: I only arose for a point of information. I wanted it distinctly understood that after study—well, that we go along in an orderly way and have time to make the study.

Chairman Mollin: You will have a whole year.

Dr. Smith: I know the Executive Committee is rushed at the last minute, and I certainly don't want to have them rushed too hard on something of this kind.

Chairman Mollin: I don't think you should attempt to decide on it at this session, because you will not have it in time. You have a whole year to do it.

Dr. William Schwab (Illinois): The resolution did not state who the Chairman should appoint to that committee. I think there should be some recommendation made as to the members of that committee. It should be made up both of livestock people, members representing producers, and the state veterinarians, and possibly local veterinarians. I think that committee should be made up of various personnel fairly well representing all types of interested people in this Association. That should be made clear.

Dr. Smith: I think the gentleman's remarks are well taken, but I don't think we need worry at all. We have confidence in the presiding officer. We had that confidence when he was elected as Vice President, otherwise we never would have put him in office.

I am sure that Ray Willoughby and Mr. Mollin and others who feel we should make this study will appoint a committee representing all of the groups. For my part, I am perfectly willing to have the committee appointed by the Chair.

Chairman Mollin: Thank you, Doctor. I am quite willing, and I intended to try to have the various groups and sections of the country represented. I thought there should be one Bureau of Animal Industry man on it, and others from the producers and scientific members. That will be okay, will it not, Dr. Schwab?

Dr. Schwab: Certainly.
PROPOSED REVISION OF CONSTITUTION AND BY-LAWS

MR. HERMAN AABEGER: In support of this motion, I would like to say that although this organization has done a wonderful piece of work in its fifty-four years of history, I believe it is more or less at the crossroads, and unless we take this question very seriously we will not make progress in the next two years that we should make.

Speaking as a representative of the American Farm Bureau Federation, I feel quite confident that if this is carried through it will give this Association a shot in the arm. It will mean that it will be possible to encourage a large number of livestock producers and others interested in participating in this Association actively, and so I want to pass that on to this group and commend them for the fine work they have done and are doing.

I believe this action will be the shot in the arm we need in order to do more that needs to be done.

MR. WILLOUGHBY: My reason for bringing this up is that this is your fifty-fourth convention. I have attended only five or six; but when this Association was set up fifty-four years ago you were like all other associations at that time: You didn't have a lot of members.

You have expanded. You have carried your message to the field. You have done a wonderful job for the livestock industry. More livestock men are getting interested every year. I know I could get a lot of members down in my section of the country. But they all say, "Do we have anything to do, or do we just pay our dues? What kind of an organization is it?"

It is for the benefit of this organization, gentlemen, that I am bringing this up. I think you will profit twofold by reconsidering your By-laws and giving the lawmaking body, so to speak, some voice in the policy making ideas of this Association.

I have no quarrel with it at all. I think this is a fine organization. We need it—but by the same token I think you need producers.

CHAIRMAN MOLLIN: Are you ready for the question? The motion is that the Chair appoint a committee, as stated. (The motion was put to a vote and was carried unanimously.)

CHAIRMAN MOLLIN: Before proceeding with the program I will appoint the committee that was voted to be appointed this morning for the purpose of suggesting a revision of the Constitution and By-laws. I have tried to pick a committee that will well represent all of us in this Association. I think it is going to have a mighty difficult job to do, and we can trust that they will bring in a report that will solve the problems which confront us.

That committee will consist of Dr. Smith, New Hampshire, as Chairman; Dr. Wilkins, of Montana; Dr. Fladness, of the Bureau of Animal Industry; Mr. Tom Arnold, of Nebraska, and Dr. Carr, of California.

I might say that ordinarily, inasmuch as Mr. Willoughby was the man who presented the resolution, I should appoint him on the committee, but he requested that I appoint Mr. Arnold in his place.

While I had an opportunity this noon to speak to Judge Montague, I think the Judge would be glad to sit with the committee and offer his legal services to help get the language in proper shape, if the committee so desires. I will leave it up to the chairman of that committee to contact Judge Montague if he wishes to have his help.
CHAIRMAN MOLLIN: Before we take up the report of the Nominating Committee, we might have the report of the committee appointed the day before yesterday, concerning the revision of the By-laws. Dr. Smith was made chairman of that committee.

DR. SMITH: Report of the special committee to review the Constitution and By-laws:

"Your Committee has given serious consideration to the advisability of amending the Constitution and By-laws of the United States Livestock Sanitary Association. Your Committee recommends:

"1—That Article III, 'Memberships', be amended to extend the membership of the Executive Committee to one official representative of national organizations of the livestock industry, officially recognized as such, said representation not to exceed ten in number.

Your Committee further recommends: "That the Executive Committee adopt a policy whereby all committee reports be presented for discussion on the floor of the convention immediately upon their presentation and before they are referred to the Executive Committee for final approval or disapproval.

Your Committee further recommends: "That the membership of the various committees be extended to include a larger representation of the particular industry involved."

The report is signed by myself as Chairman, A. K. Carr, H. F. Wilkins and S. O. Fladness. One member of the Committee did not sign.

CHAIRMAN MOLLIN: It is my understanding that under the By-laws this report has to go to the Executive Committee, and if approved by them at the convention in Kansas City next year, approval by the convention will make it officially in effect. Is that your understanding of it, Dr. Smith?

DR. SMITH: Yes.

CHAIRMAN MOLLIN: Are there any remarks on the report of this Committee?

DR. CAMPBELL: A question of information. At the meeting in Kansas City it can be amended in any way the Association sees fit, can it not?

CHAIRMAN MOLLIN: I would assume so. It seems to me that the convention ought to have the power. I never saw a set of By-laws exactly like the By-laws of this Association, but I assume that either today or a year from today the convention ought to have the power to amend. Dr. Smith, what is your opinion on that?

DR. SMITH: It is not entirely clear.

CHAIRMAN MOLLIN: I don't think it is, either.

DR. SMITH: "The Constitution of this Association may be amended by a two-thirds vote of the members of the Association present and voting at an annual meeting, provided that the specific amendment to be acted upon shall have been presented in writing at a previous annual meeting, and further provided that the amendment has received the approval of the Executive Committee."

CHAIRMAN MOLLIN: I would rather assume from that that if the convention has any power to amend it, it would be now, rather than a year from now, because if it were amended at the convention in Kansas City the amendment would not have had the approval of the Executive Committee.
I might say, Dr. Smith, that there is one thing about the report of your Committee that I dislike. It would appear to cut out the Texas and Southwestern Cattle Raisers Association. That has been a very active organization. They have membership in quite a number of states. Mr. Willoughby and Judge Montague and other members have attended numerous meetings of this Association, and I think they ought to be eligible to membership.

Dr. Smith: The Committee disliked that as well as you, Mr. Chairman, but we spent two days discussing this question, and it seemed to us that there was no end to strong organizations that might feel that they would like membership on the Executive Committee.

This is a unique organization. That is why it has a unique Constitution and By-laws, I suppose. It was felt that at least for the present it should be confined to those organizations that are national in scope.

We took, for illustration, the poultry industry, because that is a little foreign to livestock in a way, although in our Constitution and By-laws poultry is included as livestock. I believe there are forty or fifty organizations of national scope represented in that industry, such as the National Baby Chick Association, the National Broiler Association and others. They do have one parent national organization that represents all phases of their industry, and if we are to make a start anywhere we felt we should do it this way.

Chairman Mollin: I have just been advised that the fifth member of the Committee, Mr. Thomas Arnold of Nebraska, will be in the room in a few minutes with a suggestion. I would like to ask the indulgence of the meeting for a few minutes until he returns.

Dr. H. E. Curry (Missouri): Mr. Chairman, during the interim I would like to ask Dr. Smith to elaborate just a little bit for the purpose of bringing us up-to-date on just what he means by organizations or associations of national scope.

Dr. Smith: That question cannot be answered by me, Dr. Curry, but in the recommendation it states, “Officially recognized as such.”

Dr. Curry: Who will be those who are going to officially recognize them as such, may I ask?

Dr. Smith: I would expect that would have to be decided by the Executive Committee of this Association. Certainly I would not do it as an individual.

Chairman Mollin: I might say that I see another objection to the report of the Committee in its present form.

There is an organization in the corn belt called the Corn Belt Feeders Association. It has been very active in the last two or three years. I expect its members are confined probably to about eight of the corn belt states, and yet it represents a distinct segment of the industry. It would be barred, too. It is a regional organization, just as the Texas Southwestern Association is regional. It would be barred from membership, and I think we ought to have membership in the corn belt.

Dr. Smith: That is why we made further recommendations perhaps not requested in the motion made Tuesday. We recommended that all of these reports submitted here be open for discussion on the floor so that any member or any number of mem-
bers would have an opportunity to express their desires on the matter, before the Executive Committee has anything to do with the report, with the assumption, of course, that the vote of the governing body would take cognizance of what was stated on the floor and the expressions made on the floor.

Again, in making up these reports, we recommend that a larger representation of that particular industry—for instance, again referring to poultry, if it were a report on the poultry industry we would expect that poultry men would be put on that committee rather than beef men or dairy men.

In the final analysis it would rest in the Executive Committee, on which we have made room for not more than ten representatives of national organizations. It must be a national organization that represents all factions of the industry. How that is to be decided is up to the Executive Committee.

**Dr. Curry:** In that connection, Dr. Smith, you mention the National Baby Chick Association.

**Dr. Smith:** It was just an illustration.

**Dr. Curry:** And the National Broiler Association. May I bring to your attention the fact that they are all incorporated under the caption “International Baby Chick Association”. Where do we go from here? You deny a representative of the Missouri Livestock Growers Association. You say the organization must be national in scope. Then we sift it down and find that we are dealing with international organizations.

As a matter of fact, you do not have a National Baby Chick nor a National Broiler Association, but there are some splendid broiler associations and some splendid baby chick associations.

It seems to me, Mr. Chairman, that this is a most vital question, and we should know where we go from here. If we are going to be international in scope, then perhaps it would be in order to have the International Harvester and other associations in this group.

I was under the impression that this was primarily a livestock organization, established for the primary purpose of administering to the needs and requirements of the state livestock industry of the state which we represent. I am somewhat amazed to learn (and I don’t know who proposed this thing) that now all of a sudden we have become national in scope, and then we include international organizations.

I am only asking for information, to get the question clear. I do not wish to argue this thing nor debate it, but I am asking for clarification so that when we leave here we will at least have a clear conception of what in the world we did and what we accomplished while we were here. That’s all, Mr. Chairman.

**Dr. Smith:** There is nothing in here that refers to any international organization. Certainly we would not pick out the baby chick end of it. There is a National Poultry Producers organization. I can’t give you the exact title, but as far as my limited knowledge goes, at the present time that would be the only one that would be eligible for election to membership on the Executive Board.

Presuming that that representative would be the representative of all the poultry organizations that we have referred to here, the international end of it would not enter into it at all.
SECRETARY HENDERSHOTT: But we are an international Association.

DR. CURRY: I simply arose to keep the record straight.

CHAIRMAN MOLLIN: For those who have just come in, we are considering the report of the Committee that was to make a study concerning amendments to the By-laws.

It is my understanding, after reading the By-laws of this organization as they stand today, that the only way this report could be changed or amended from the way it is submitted by the Committee would be to do it now. After it goes to the Executive Committee, according to the way your By-laws are drawn, if the Executive Committee approves it, then the convention next year will have to approve it as approved by the Executive Committee, before it can become effective.

The discussion has been on the point of whether such regional organizations as the Texas and Southwestern Cattle Raisers Association and the Corn Belt Feeders Association are eligible to membership, because the Committee’s recommendation specifically says it is limited to national organizations recognized as such.

JUDGE MONTAGUE: Mr. Chairman, may we have a re-reading of the report? (Dr. Smith re-read the report of the special committee.)

JUDGE MONTAGUE: Mr. Chairman, I would like to speak to that for a minute.

Just as I walked into the hall I heard a remark that seems to exemplify the attitude of some of the members of the Executive Committee. Dr. Smith said, “We will give you this representation.”

We don’t ask him to give us one damned thing. We are not asking to be given anything. We feel we have something as a right, that is ours, and we don’t ask any of you to give us anything.

Gentlemen, I understand that this organization was formed for the protection of the livestock industry, along with the other purposes set out in the Preamble to your Constitution. It is not an exclusive organization; it is supposed to take in all branches of the industry. It is not organized on a national basis, otherwise how would you gentlemen, representing only one state—what right do you have to be on there with representation on the Executive Committee, saying it shall be only on a national basis? You as individual state members have no more right to be on that Committee than any organization that represents a state.

Dr. Smith, for instance, has less cattle in his State than we have in many of our 254 counties in the State of Texas. I speak now as the official representative of over nine million head of range cattle in the State of Texas. You don’t have more than about 50,000 in your state; do you?

DR. SMITH: 150,000.

JUDGE MONTAGUE: All right; 150,000. And yet he is on a national basis, and I am a little shirrtail fellow down here at the crossroads, representing nobody. Is that right?

I call your attention to this also, gentlemen of this convention: You have now sixty-four members of your Executive Committee. Fifty-six of them don’t even have to be members of the Association. You have only five members of your Executive Committee who have to be members of the Association; the other fifty-six are members of the Executive Committee, running your business and mine when they don’t even have to belong to the Association; and a great many of them do not belong; is that right?
You have named on your Executive Committee some fellow from Puerto Rico, some fellow from the Virgin Islands, some fellow from Hawaii, some fellow from Alaska; and yet you would exclude the Texas organization that has over 9 million cattle in its State. Is that right?

Who has the most interest involved? Your organization says that if you are interested in livestock and in livestock sanitation you may belong to the Association; and yet they would have us join the Association, they would like our dues, and yet we are—and I want to use this word advisedly—we are discriminated against. Is that democracy, gentlemen?

Is it democracy to ask us to belong to an organization that tells us, "Yes, come in and join, but you can’t be on the Executive Committee"? Our policies, the policies that are going to control your business, are to be determined by an organization that does not have to belong to the Association. Can you imagine any business of that kind? There isn't a comparable situation in any business organization in the world like that. There couldn't be.

For that reason, Mr. Chairman, I move as a substitute for this Committee report something that I think will be fair. I offer as a substitute for this Committee report the following:

That it be recommended by the Committee that Article V of the By-laws be amended in the second paragraph thereof, which now reads as follows: "The Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies;" that that paragraph of the By-laws be amended to read: "The Executive Committee shall constitute the administrative body of the Association."

On that point, gentlemen of this Association, are you satisfied? Do you think it right that you, as a member of this Association, do not even have the slightest voice in determining what any policy of the organization shall be? You are a member; you pay dues; you are different from the Executive Committee, which doesn't even have to be members of the Association. You pay dues, and yet you can't even vote on a question of policy of the Association. It is the most astounding situation that ever existed.

I offer as a further substitute that a part of the same substitute be another paragraph thereof, as follows: That Article V of the By-laws be amended to read as follows—that article dealing with the Executive Committee, which now reads, "The Executive Committee shall be composed of the executive officer representing the livestock sanitary departments of the various states and territories; the Chief of the Bureau of Animal Industry; the Veterinary Director General of Canada, the executive regulatory officer of Cuba and Mexico, and the elective officers of this Association."

I move that as a substitute that paragraph of Article V be amended by adding thereto, "And by one stockman from each of the forty-eight states of the Union, such stockman to be duly selected and nominated by the livestock association operating in that state."

I have one further suggestion to make as a substitute for the Committee report, and that is that Article V of the Constitution and By-laws be amended so that that part or section of Article V, dealing with the Executive Committee, the third paragraph thereof, which now reads, "All recommendations and reports of officers and
committees shall be referred for consideration to the Executive Committee," as a substitute therefor the following be adopted: "All reports of committees shall be made to the general assembly of the convention, and final action by the convention shall determine the policy of the Association with reference to such committee reports."

I make that motion in perfectly good faith. I make those motions with the idea that I can help this Association. This Association, I repeat again, was originally organized and exists today for the announced purposes set up under the Preamble to the Constitution, for the benefit of the Livestock Association. Of course, the eradication, suppression of disease, would be for the benefit of the Livestock Association. We know that.

We know that you are trained scientists and are the best ones we can get to do that; but we do not lose sight of the fact—and we hope you will not do again as apparently you are doing now, that is, lose sight of the fact—that in the ultimate these livestock people own that property; it is their property, and it is up to you to show them the things that will protect them, and they are going to do it. But it is not up to you to give us anything, nor to demand anything from us.

Mr. Chairman, I move the adoption of the substitute report.

Mr. Tom Arnold: I second the motion.

Chairman Mollin: The substitute should have been presented in writing.

Judge Montague: I can't write; I have a broken arm. If you insist on that technicality I will ask the stenographer to write it up and turn it in.

Chairman Mollin: I suppose we can have it in writing before the Executive Committee gets through with its meeting this afternoon. I will leave it to the house if they are willing to make that concession. Do you have any objection, Dr. Smith?

Dr. Smith: I have something to say. I think the Judge is a little mixed up. It will have to be in writing. I think his intentions are all right, but he has been referring to Articles of the By-laws when he is actually reading from the Constitution, and vice versa. Article V that he refers to in the By-laws has nothing whatsoever to do with what he said.

Judge Montague: This is what I was reading from, put out officially by you people. I challenge the gentleman's statement.

Dr. Smith: You were on the wrong page. By those same words I challenge the Judge's statement when he infers that the members of the Executive Committee do not pay dues. As a matter of fact, they are the official representatives of the sanitary division of their respective states, and they pay $50 dues, not $3.

Being a representative of their official states, they are not required nor expected to pay individual dues.

Judge Montague: Mr. Chairman, will the gentleman yield for a question?

Dr. Smith: Not yet. Another thing I want to make clear is that remarks were made pretty personal to Dr. Smith. I was appointed as chairman of a committee that no one cares to carry on, not even myself. As chairman of that committee I feel that I am obligated to carry out the work of that committee in as just and impartial and honest and straightforward way as I possibly can, gathering such information as I could individually; and I know the other members of the committee were just as conscientious as I.
We tried to come to some middle road whereby we could get together and have somewhere near a common understanding, meeting all of the problems that confront us in a report of this kind.

Gentlemen, you need a mastermind if you are going to satisfy all of the interests that have even been referred to by my good friend the Judge. There always has to be a stopping place somewhere, and no one regretted any more than I when we felt that for the present at least we must confine the eligibility to the representatives of national organizations.

JUDGE MONTAGUE: Mr. Chairman and gentlemen, will the gentleman yield?

The chairman's statement was that the Executive Committee pays dues. How many of the ex officio members pay dues? Does the representative from Hawaii pay dues?

DR. SMITH: You will have to ask our Secretary-Treasurer.

JUDGE MONTAGUE: Mr. Secretary, will you answer that question?

SECRETARY HENDERSHOTT: Judge, I could not answer that truthfully right now, but if you want an answer I can get it for you in half an hour. The Territory of Hawaii pays official dues but right now I could not say that their representative Dr. Ernest Willers does or does not pay individual dues.

JUDGE MONTAGUE: The point I am making is this: Whether or not they pay dues, they are members of the Executive Committee.

SECRETARY HENDERSHOTT: That is true, and I would state, in connection with your statement relative to the payment of individual membership dues by official representatives of states, that it would be my guess that better than half of them maintain individual memberships. I, for one, maintain an individual membership and have done so for years in this organization, although my State, as do other states, pays an annual fee or dues of $50.

There are many other men here who maintain individual memberships. I have the record book in my room upstairs, and if you desire I will be very happy to get it and read off to you the names of those state regulatory officials who maintain individual memberships.

JUDGE MONTAGUE: States and territories. I don't care about the states. It is when they come in there and put us under—

SECRETARY HENDERSHOTT: The territories also pay official dues, just as the states do.

JUDGE MONTAGUE: Do they do it?

SECRETARY HENDERSHOTT: I would like to correct the statement that you made, that sixty-four hold official memberships. That is not true. At the present time each one of the forty-eight states has an official membership. Los Angeles County, California, has an official membership. The Territory of Hawaii has an official membership. Puerto Rico has an official membership. The Dominion of Canada has an official membership, as does the U. S. Bureau of Animal Industry, and that is the total.

JUDGE MONTAGUE: Dr. Hendershott, I did not say they were official memberships. I said members of the Executive Committee.
REPORT OF SPECIAL COMMITTEE

SECRETARY HENDERSHOTT: Those that I named are members of the Executive Committee, and that's all.

JUDGE MONTAGUE: How come Los Angeles County would be on the Executive Committee?

SECRETARY HENDERSHOTT: That I could not—

JUDGE MONTAGUE: They could not be, under your By-laws and Constitution.

SECRETARY HENDERSHOTT: I can't answer that. All I know is that at the time I joined the Association, they were members of the Executive Committee.

JUDGE MONTAGUE: They couldn't be, under the Constitution and By-laws.

SECRETARY HENDERSHOTT: That's how it is, Judge.

JUDGE MONTAGUE: The only thing I say now, sir, is that we even have somebody on there that we didn't know about. We are going to hatch some more chickens, maybe, before this is over with.

CHAIRMAN MOLLIN: I recognize Mr. Arnold.

MR. TOM ARNOLD (South Dakota): Members of the Association, I was a member of this committee—I might say the minority member of the committee that brought in this report. I feel that in fairness to the people I represent I should give a minority report at this time.

This request for a change was brought about by a meeting of the livestock people attending this Association. This Association has so listed the membership of livestock people over these United States. I know I have received letters from Dr. Hendershott suggesting that I try to get members for this organization.

Following through on that, I had ten or twelve of our men from South Dakota come down here, some 1,500 or 2,000 miles, to participate in this meeting. We didn't come here for the purpose of dominating anything. If we had, we certainly would have had more than ten or fifteen men here.

We came down here to participate in this meeting. These men are livestock people. They are some of the owners of the livestock of this country, men who own the livestock about which you people are making recommendations for sanitary laws and regulations. Their cattle and livestock will be affected by those things.

We don't want to dominate this Association. Please understand that. We only want to have something to say, as owners of the livestock that these regulations or laws will affect. We want to sit in this meeting and have a vote on these regulations or recommendations that may be made to the Bureau or to our various states, or on the legislation that may be presented in Congress or our state legislatures.

We just want to sit across the table with you men, the technical advisers in these matters, because we feel we can come to a better understanding in making such recommendations, either for laws or regulations.

I am going to leave it to you. In all fairness, isn't it a better way to do this job by bringing about such recommendations in that way, by sitting across the table from each other and discussing these things, you giving the scientific angle and we giving the economic angle, and then presenting regulations to the Bureau, or presenting a bill in Congress, than it would be for us, leaving out the scientific end of the thing, and asking for certain regulations or laws, or you leaving out the economic end of it and the practical end from the ranching or farming side?
Why can't we sit down together? That is what we want to do. We want to work these things out. That's the only thing we are asking for. We don't want to dominate anything. There has never been any history of our coming in here and asking for such a thing that has been done.

When a regulation comes from this group, which, after all, is the scientific end of our business, and is presented to the Bureau, and then they come out and give us warning that such a regulation is to be imposed, we must then go to Washington and fight it or amend it. Or, if a bill is brought before Congress and introduced, if it isn't one that we can go along with we have to go before Congress and oppose that bill. Perhaps a little thing or two in the bill we should have.

Why shouldn't we sit down among ourselves? I think we are big enough to do those jobs, and God knows if we aren't we aren't big enough for the jobs we are trying to hold. That is what we are asking for.

We are asking that this be amended. We would like to put this Association back as it was at its beginning. This Association was formed fifty-four years ago because of the necessity of tick eradication. The livestock people sat here and had a vote with the regulatory men on the measures that came up. They sat down and worked out that matter, and eradicated the ticks in this country.

As time went on and that job was accomplished, the livestock men more or less lost interest. The regulatory men, because the states were paying their way here and paying their dues, continued with this organization. It was a fine thing that they did. There are many fine things that have come out of it. The scientific matters that are discussed here are of value to the industry. The more you men can learn and get out of this thing, the better servants you will be to us.

Finally, this became more or less of an organization of regulatory men. The power and authority and everything else was in the hands of the regulatory men of the country. We have many problems that our men in this country now are very much interested in—brucellosis, tuberculosis, swine diseases, and so on. We now want to have something to say, and we are asking you for an opportunity to sit in and get the job done.

What we want is a vote. There may be many ways to go about it. This is the only organization I know of—and I have had to do with some fifteen or twenty producer organizations—where this little group of an Executive Committee is the policy-forming body and also has the last say on anything that is to be done.

We, the owners of the livestock, have nothing to say. We have nothing to do. This committee very condescendingly offers to give us a chance to express our views on the floor. Do you think we are going to get men to come 2,000 miles just to discuss something on the floor, and then turn it over to you men to do with as you wish?

I have seen many regulatory men who have gotten just a little bit over-anxious to perform some particular job, and who went a little too fast with it and built up a rebellion in the community that took years to wear down. If they had taken just a little more time, as many times the stockmen want them to do, the job would have been accomplished much faster.

I can promise you that if the livestock men have an opportunity to sit on this
thing and discuss these problems with you, and take the findings back to our people, we will accomplish such things as control and eradication of brucellosis much faster than if you try to tell these men, "This is what you are going to do."

Remember, fellows, these men are rugged individualists. You may lead them, but you will never drive them a step. Let's show them what we can do, and let's try to work with them and not set up an organization such as this, that they are going to have to accept regulations for or recommendations for regulations.

In all fairness to the livestock industry, let's go down the road and meet them at least half way. We want to do that with you. We need you men, and I think you need us; so let's try to get together. Let's adopt this amendment to the motion as offered by Judge Montague.

Thank you. (Applause)

CHAIRMAN MOLLIN: Are there further remarks from the floor?

SECRETARY HENDERSSHOTT: I would like to speak on the subject for just a minute. I appreciate very much the remarks made both by Judge Montague and by Tom Arnold with regard to this matter. I think all of you people know that I have been anxious to bring about a closer liaison between the livestock producers and the livestock regulatory officials.

There are just one or two points that I think are worth while mentioning, that might somewhat clarify our relative positions. One is that we, as individual regulatory officials in our respective states—some through political appointment, unfortunately, because I do not believe that a politically-appointed state regulatory official is entitled to or has the opportunity to voice his unmitigated or uncontrolled answer to some of the problems that are presented to him in his state—personally, I would prefer to see all of them civil servants, held responsible for carrying out the duties of their office, and subject to dismissal for failure to carry out their duties on behalf of their people, above political interference in the decisions they may have to make.

Be that as it may, others are representatives of livestock sanitary boards, such as secretaries of official livestock sanitary boards. Others are directors of divisions of animal industry set up under civil service, under the state board of agriculture in their respective state.

In their official position, and by legislation in their respective states, they are charged with the responsibility in their area for the control and eradication of diseases of livestock; so they have a duty to perform to government and to the people in their respective states.

I feel that when I come to this Association I represent the swine, the poultry, the beef and the dairy interests—in fact, all of the livestock interests of my respective State. They know of my action in this body. I make it a point to see that they are well informed of my activities in this body.

If there is a matter of controversy that is to be brought up before the Association, and if I am aware of it, I discuss it with the leaders of the industry in my State before I come here, so that I might know their thinking.

Therefore, I am in a little different position than just a representative on the Executive Committee representing no one but myself and my own thinking. I desire
that we have a closer relationship with the livestock interests, whether they be poultry, swine, dairy or beef breeding or what-have-you across the nation.

There are conditions that exist in one area that do not exist in another. The only way we can become informed on those is through rubbing elbows and sitting down and discussing some of our common problems.

We don't know everything about this business. I certainly would be the first to admit that there is a great deal that I have yet to learn. I need the counsel—I get the counsel—of my people back home. I need the counsel of other people. I like to get the shading of opinion here and there. I think it broadens one and gives one a more comprehensive idea of what this is all about.

After all, we are one nation, and in this day and with these means of transportation, what affects one state must of necessity affect an adjoining state, sometimes a far-off state. Even though some of you here in the southwest feel that we people in that little old garden State of New Jersey have no concern about what goes on out here, we are much interested in what goes on, and the manner in which it is carried out, because it has the potential possibility of having its effect as well upon us up there.

I would desire very much to see all of us get together. I think it would be a splendid idea if we could have representation on our Executive Committee. However, I do not wish to see the matter come to such a point that we are stymied in carrying out those things that are necessary from the scientific standpoint and advancing the control and eradication of disease in our respective areas.

It is true that many of the decisions of committees taken at this meeting are put into national plans. For years, dating back to 1897, the U. S. Bureau of Animal Industry has taken cognizance of the recommendations of the men who meet in the U. S. Livestock Sanitary Association. They have a definite feeling that we have a cross-section of weighted opinion that should be given some thought and consideration.

As we look back over the history of this Association for a period of fifty-four years, it has been one in the early days of many vissitudes because of the lack of monetary backing to carry on some of the functions that should be carried on; and at the time it originally met, it did so as an individual Association of State Livestock Sanitary Boards. That is what the Association was called for the first thirteen years of its existence.

As far as I can find out, they had no Constitution or By-laws in those days. They just drifted around more or less aimlessly, and did a pretty good job. Noteworthy was the stimulation of tick eradication. In 1910 a committee was appointed on Constitution and By-laws, and they set up essentially the Constitution and By-laws which we have today, which were amended in 1919, 1920, and again in the early '30s.

There seems to be, in this committee that was appointed to study amendments, a lack of uniformity in their thinking and decision. However four of the five committee members agreed on the proposition presented by the chairman Dr. Smith. To me this is a rather serious thing, when you start to open up a Constitution and By-laws of an organization which over a span of fifty-four years has made slow but steady
progress, an Association that has the good will and has held the faith sufficiently so that the Bureau of Animal Industry looks to this organization for guidance in some of its rules and regulations.

Out of this organization in years passed has come the fundamental laws, rules and regulations that govern the control and eradication of tuberculosis, ticks, glanders, dourine, contagious pleuropneumonia; so we have a good record of accomplishment.

I would like to see us go forward. I think when we get to changing the Constitution and By-laws under which we have operated so successfully, with so few people maintaining individual memberships, we should pause and give great consideration and great concern to an adjustment of those rules.

I was quite disturbed Wednesday morning when Mr. Ray Willoughby asked for permission, as provided under our Constitution, to address us, and when he made a remark to the effect that they wished to shorten the time in which this amendment might be made effective, by a period of a year. We were asked to have a committee appointed on Wednesday to study this, which to me is a rather momentous problem, and come back in forty-eight hours with something that they had thought out, then present it to us, have us act upon it and accept it so that it might be put into action in 1951.

The thought that went through my mind was, why the urgency for such a change? What problems do we see in the next six months or year that make this urgent action so necessary?

Perhaps it might be in order to offer a substitute motion at this time, provided the maker of the previous motion and the second would accept it, to the effect that this question of the revision of our Constitution and By-laws be given to this Committee for study (you may add others to the Committee as you see fit, although I think the Committee is all right as it is), and that this Committee give some thought and study to this matter during the year.

Let's find out what organizations are nationwide in scope and which ones are not. Let them come to us next year with a written report and recommendation not only on these two particular paragraphs, but whatever other paragraphs in our Constitution and By-laws seem to need revision and be brought up-to-date.

I have worked with the members of the Executive Committee of this Association continuously for fifteen years. My judgment of them is that they are inherently fair, honest and cooperative. I think in all of our deliberations in this Association, as far as I have knowledge of them, we have tried always to keep in mind the fact that we are charged with the responsibility of disease control and eradication in our respective states, and we have always tried to bring into that program the recommendations of industry in so far as they were compatible with sound disease control and eradication.

You will all recall that some years ago, after considerable discussion, we came out with a program for the control and eradication of tuberculosis for range and semi-range animals. That was a deviation from the program originally set up for the control and eradication of tuberculosis.

So, let's give a little time to this. I would recommend to you that we study it and give it serious thought and consideration. Let all angles be examined, and all avenues explored. It isn't often that we have to change our Constitution and By-laws.
Let's take a little time about it, and let's have it right when we come forth with a recommendation.

Thank you. (Applause)

Chairman Mollin: Dr. Hendershott, are you offering that as a substitute for the substitute? I didn't know we substituted so far.

Dr. Campbell: Mr. Chairman, I think a motion to refer the matter back to the Committee takes precedence over a substitute motion. If I am not wrong in that, I would like to make such a motion.

Chairman Mollin: Will you come up to the microphone so that we can all hear you, please?

Dr. Campbell: I have always found it a good policy to use brains wherever you can find them. There is no question about the brains that we could use among the producers, and the influence we should be glad to have.

To me, the Committee's report is unsatisfactory in that the representation given producers seems to me entirely inadequate. On the other hand, we must not overlook the fact that these official representatives are officially responsible for what is done, and not the rest of us. I think they should have control of it and three-quarters or four-fifths control is certainly not necessary.

I agree so heartily with Dr. Hendershott that we are trying to do this too fast, that we are not ready to act upon it yet, that I hereby move that this question be referred back to the Committee, to an enlarged committee, with instructions to report the first day of our next meeting.

Chairman Mollin: Is there a second?

Dr. Smith: I will second that motion.

Chairman Mollin: It is moved and seconded that the report be referred back to an enlarged committee, with instructions to report back to Kansas City, Missouri meeting.

Judge Montague: Mr. Chairman, when one of you doctors has a very critical disease and you are handling it, and it has reached the point where you have to open up that boil or carbuncle, or whatever it is, you don't refer it back to a committee. If it is a point of life or death, you grab it and take it out.

You are in that situation here. The points that we have offered these substitutes on are so fundamentally proper that there is just no reason why any time should be lost fooling with them. It has got to wait a year. But on the very point of having your organization run by a group of men who don't even have to be members of the Association, why do we have to wait a year to deliberate about that?

On the point as to whether or not you as a member of the Association shall have a vote on any of the policies of the Association, or have a vote on anything, to me that is so fundamental that—why, there's just no reason to wait at all. I just can't understand why principles of democracy, which are being overridden by the present By-laws, should be held up for another year. It is incomprehensible to me why anybody would want to tolerate or keep that condition in existence. Mr. Chairman, I move that this gentleman's motion be tabled.

Dr. Duval Davidson: I second the motion.

Chairman Mollin: Those in favor of tabling the motion will please stand and remain standing until counted. Those opposed to tabling, please stand.
There are 31 in favor of tabling and 22 against. The motion is lost.

JUDGE MONTAGUE: I voted to table—

CHAIRMAN MOLLIN: We don't want anybody mixed up here. The vote is on the motion to table Dr. Campbell's motion, which was to refer it back to the Committee. Let's do it over. Those who are in favor of tabling Dr. Campbell's motion to refer, please arise and remain standing.

SECRETARY HENDERSHOTT: When you stand and vote for this tabling, you are not voting to refer this back to the Committee for consideration for a year.

CHAIRMAN MOLLIN: Those opposed to tabling the motion will stand. The vote is 29 to 29. That makes it a tie vote.

JUDGE MONTAGUE: The Chair will have to decide it.

CHAIRMAN MOLLIN: That puts me in a nice spot! (Laughter)

DR. SMITH: You've had me in one for two days. (Laughter)

DR. J. V. KNAPP (Florida): I wish to speak on the amendment, and I request the privilege of diverting for a minute or two before discussing the point.

In my State it is my custom to deal directly with the cattle men that are affected, the swine people, and also the dairy interests. The closer we get together, the faster we go. I believe that can be done in this organization to a degree.

As I have said heretofore, I am zealous concerning the prerogatives which are the authority and the responsibilities that lie in the directors' group, but I am liberal-minded to the degree that I can understand that the livestock industry should have representation.

Now, speaking on the point of the substitute for the report, I do not have that in writing; but if my memory serves me correctly, the substitute called for forty-eight representatives of the industry to meet with the forty-eight representatives of official organizations. So far, so good.

The next amendment or substitute dealt with the consideration of reports that come from the floor and from committees to this desk, and then, heretofore, to the Executive Committee for further and final action.

I believe the Judge stated that final action would be taken here by a vote on the floor. That being true, if adopted there would be no reason why we would have an Executive Committee composed of forty-eight state representatives, state livestock sanitary officials, and forty-eight representatives of the industry. That is incongruous, as I see it.

If the Judge would accept an amendment to his substitute, that matters which need more discussion, such as is given presently by the Executive Committee—papers and reports—being referred to them, which is a smaller body and which could have conclusive discussion there, and then could come back here and receive the approbation of this body, it would make more sense to me.

I am speaking now for clarification of the point. Then there would be a reason for the Executive Committee, composed of the livestock sanitary officials, the representatives of the forty-eight states, respective industry, and they in turn would attach their recommendation for the immediate passage, disapproval or further consideration.

Thank you.

DR. DAVIDSON: Gentlemen, I come before you as the livestock sanitary official in
Texas. In that position I am not a veterinarian. For thirty years I have been working with the livestock industry in Texas. During those thirty years such authority as I have been delegated was strictly a delegated authority.

Our state representatives—they say Texas brags, but this is not bragging—10 per cent of the cattle, 30 per cent of the sheep and 85 per cent of the goats of the nation are in Texas. The hog and poultry industry does not rank with some of the other states, but in doing this our industry has sent me here, and I believe every man within the sound of my voice, who is a regulatory official, is in the same position that I am in.

I would have to go back to that industry and report to them that they are not to be granted a voice in the actions taken by this assembly.

We have in our industry in Texas, and you men have in your industry in your states, men whose ability has been sought by the President and the members of his Cabinet. That has been done as recently as the threat of foot and mouth disease in the Republic of Mexico. Sitting within the sound of my voice is one member on that committee. I think it would be somewhat of a source of embarrassment to each one of us if we had to go back home to our industry, which has seen fit to sponsor laws authorizing our activities—we are their representatives—and tell them that they are not eligible for advice, when that advice has been sought not only nationally but internationally.

Thank you.

Chairman Mollin: It is my judgment that we might as well settle the issue here, and I will therefore cast my vote to table the motion to refer, which leaves the matter again before the house. The matter before the house now is the substitute motion.

It seems to me that before we go any further with this matter we ought not to proceed with any possibility that the action we take here today would be challenged next year because it might not have been properly handled. Therefore, I am going to ask if there is objection to our proceeding without this written substitute, with the understanding that it will be immediately presented to the Executive Board, which of course will have a full year to consider it.

Is there anyone who is unwilling to waive the rules and let Judge Montague furnish the substitute motion immediately to the Executive Committee?

Dr. Smith: I don’t know that I have any objection to its not being in writing, but if we are going to do this right we have got to stand by the Constitution and By-laws.

Judge Montague: Then I ask the indulgence of the assembly to go into recess so that I can prepare it.

Dr. Smith: Just a moment, Judge. I am not referring to its being printed.

"The Constitution of this Association may be amended by two-thirds vote of the Association present and voting at an annual meeting, provided that the specific amendment to be acted upon shall have been presented in writing at a previous annual meeting, and further provided that the amendment has received the approval of the Executive Committee.”

Now, then: If it requires a two-thirds vote—
CHAIRMAN MOLLIN: Next year.
Dr. Smith: That's right. Why doesn't it apply to this year?
Judge Montague: That is exactly the procedure we are following, Mr. Chairman. We are presenting the amendment now that will have to receive the approval or rejection of the Committee some time during the year, and then be presented to the convention next year.
Dr. Smith: You will have to get a two-thirds vote to do it.
CHAIRMAN MOLLIN: No; I will have to rule against that. The two-thirds vote comes next year.
Dr. Smith: In other words, it does not need to be voted on here at all, then? Just be presented in writing?
CHAIRMAN MOLLIN: It needs to be referred to the Executive Committee.
Dr. Smith: It has got to be presented in writing to this meeting, but there is no vote called for at this meeting.
CHAIRMAN MOLLIN: I don't think so.
Dr. Smith: In other words, it does not need to be voted on here at all, then? Just be presented in writing?
CHAIRMAN MOLLIN: In other words, it does not need to be voted on here at all, then? Just be presented in writing?
Dr. Smith: I don't think so, either. Then it has to receive the approval of the Executive Committee; is that right? That's okay.
CHAIRMAN MOLLIN: And next year it has to have a two-thirds favorable vote of the convention.
Dr. Smith: I don't make any request, Judge, that you have it written out until the Committee works on it.
CHAIRMAN MOLLIN: You have a whole year to work on it.
Dr. Smith: I mean, tonight.
Judge Montague: My motion doesn't have a thing in the world to do with the point that is being discussed. My motion is a substitute for the Committee's report. That is the point I am making.
CHAIRMAN MOLLIN: I think we understand that, Judge. Is there any further debate on the question of the substitute motion?
Dr. Carr: Does the amendment include an enlargement of the Executive Committee?
CHAIRMAN MOLLIN: No; that motion was tabled. Are you ready for the question? All those in favor of the substitute motion presented by Judge Montague, say "aye"; opposed. I will rule that the "ayes" have it.
Secretary Hendershott: Ask for a standing vote.
CHAIRMAN MOLLIN: We will have a standing vote. All those in favor of the substitute motion, please stand and remain standing until counted by the same tellers. All those opposed to the substitute motion, please stand and remain standing until counted.
The vote is 32 to 29, in favor of the substitute motion.
Unless there is further amendment, we will vote on the substitute as substituted for the original motion. Is there any further discussion? Are you ready for the question? We might as well have a division of the house to start with; it will be called for, anyway. Those in favor of the substitute motion, which is substituted for the original motion, please stand and remain standing.
Dr. Smith: I don't know what that means.
CHAIRMAN MOLLIN: We are voting on the Judge's substitute, which will be the final vote. Those who are opposed to the substitute motion, please stand and remain standing until counted.

The motion is carried by a vote of 34 to 28, so I guess that automatically refers it to the Executive Committee, and the Executive Committee has a year to consider it.

DR. SMITH: Not unless they vote to consider it tonight.
CHAIRMAN MOLLIN: That's all right. The Executive Committee can do as they please about that.

The next thing on the program is the—
SECRETARY HENDERSHOTT: Will you ask the Judge to get The Minority Committee Report or Substitute Motion typed for us?
JUDGE MONTAGUE: I will do it right away.

SUBSTITUTE MOTION

1. That Article V of the Constitution of the Association be amended, first with reference to paragraph 3, entitled, "Executive Committee," which names the Executive Committee of said organization and designated who shall be members of the Executive Committee, and presently reads as follows:

EXECUTIVE COMMITTEE

"The Executive Committee shall be composed of the executive officer representing the livestock sanitary departments of the various states and territories, the Chief of the United States Bureau of Animal Industry, the Veterinary Director General of Canada, the executive regulatory officer of Cuba and Mexico, the territories, Puerto Rico and the Virgin Islands and the elective officers of this Association," be amended as follows:

"That there be added to said Executive Committee an actual stockman from each of the forty-eight states of the Union, such stockmen to be selected and nominated by state organizations and associations representing livestock producers operating within the respective states."

That the next succeeding paragraph which presently reads,
"The Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies," be amended to read as follows:

"The Executive Committee shall constitute administrative body of this Association."

That the next succeeding paragraph which presently reads:
"All recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee," be amended to read as follows:

"That all recommendations and reports of officers and committees be made to the Association assembled in convention and that the vote of such convention shall be final on all such questions."
NOMINATION AND ELECTION OF OFFICERS FOR 1951

DR. SMITH: Mr. President, your Committee wishes to present the following nominations:
For President, F. E. Mollin, Denver.
First Vice President, Ralph West, Minnesota.
Second Vice President, T. Childs, Ottawa, Canada.
Third Vice President, F. D. McMahon, Phoenix, Arizona.

MR. ARNOLD: I move that nominations be closed, and that the Secretary be instructed to cast the unanimous ballot.

CHAIRMAN MOLLIN: Before I put that motion I think we should offer an opportunity for nominations from the floor.
Are there any nominations from the floor? There is a motion before the house to instruct the Secretary to cast the unanimous ballot, but we should give you an opportunity for nominations from the floor.
(The motion was severally seconded.)
(Dr. Smith assumed the Chair.)

CHAIRMAN SMITH: It has been regularly moved and seconded that the nominees be elected to their respective offices in the U. S. Livestock Sanitary Association for the ensuing year.
(The motion was put to a vote and was carried unanimously.) (Applause)

MR. MOLLIN: I appreciate the honor, and I want to tell you that I shall do my best to preside and carry on just as impartially as I can. I have tried to do that today. (Applause)

CHAIRMAN SMITH: Will the other new officers please come forward?
The Committee was composed of myself as Chairman, Dr. Knapp, Dr. Good, and Mr. Ray Willoughby, of Texas. We were unanimous in our choice, and we have every confidence, as do you, that the affairs of this organization will be carried on in a fine manner during the year.

Our new President has had the unfortunate privilege of working hard all this week. He has done a fine job substituting for Dr. Bishop. He will have the opportunity of presiding again next year. It has been a long time since one man has had to work two shifts, which Mr. Mollin will have to do.

On my right is Ralph West, our new First Vice President. (Applause)

On my immediate left is Dr. T. Childs, Director-General, Ottawa, Canada. (Applause)

Next to Dr. Childs is Dr. F. D. McMahon, our new Third Vice President. He is the State Veterinarian of Arizona, and he has also been our host during this wonderful convention. (Applause) Dr. West, do you have something to say?

DR. WEST: Mr. Chairman, all I have to say is that I certainly greatly appreciate this honor. There is no organization that I have enjoyed belonging to more than this, and I will work throughout the year to the best of my ability. (Applause)

DR. CHILDS: Mr. President and gentlemen, I am deeply appreciative of the honor you have conferred upon me. I will do the best I can during the ensuing year. This is a great honor, and I can't tell you how much I appreciate it. (Applause)
DR. McMAHON: It has been a pleasure to have been your host at this convention. Working with men like Mollin and West and Childs is indeed a challenge. I hope I can meet it. I will try. (Applause)

(Mr. Mollin resumed the Chair.)

CHAIRMAN MOLLIN: Before we took up the matter of the election of officers we should perhaps have asked if there was any new business. It didn't appear on the program and it slipped my mind.

Is there any new business that should come before the convention before it adjourns?

DR. CAMPBELL: Mr. President, I move that a committee be appointed to survey the prospects of hog cholera eradication and to prepare general plans, if they see fit, for submission to this Association at its next meeting.

SECRETARY HENDERSHOTT: I would like to second that motion. May I add to that?

DR. CAMPBELL: Yes.

SECRETARY HENDERSHOTT: With Dr. Campbell's permission I would like to add that on this committee we should have representation of organizations at national level, such as the American Swine Records Association, the AVMA, the U.S. Livestock Sanitary Association, The United States Bureau of Animal Industry, and that we have on that committee some outstanding men in the field of animal husbandry, in the field of virology and in the field of swine disease research control and swine producers. I have in mind such men as L. M. Hutchings, of Lafayette, Indiana; Dr. Young, of Minnesota; someone that the AVMA might appoint, also representatives from this Association, so that we have a national level similar to the committee we have for national brucellosis control—a committee devoting its time, energy and study to nationwide eradication of hog cholera.

If Dr. Campbell will accept that as part of his motion, I would like very much to second it.

DR. CAMPBELL: I will accept it except for one thing. It mentioned the AVMA appointing a member of the committee. Of course, Dr. Hendershott didn't mean that. It is merely a recommendation to the President. With that understanding I will accept it.

(The motion was put to a vote and was carried unanimously.)

DR. CURRY: Mr. Chairman, for the benefit of those who may not have learned of it, I would like to announce at this time that the Executive Committee has accepted the invitation to hold their 1951 annual meeting in Kansas City. This will be a joint meeting sponsored by the livestock sanitary officials of the states of Kansas and Missouri, in cooperation with the people of the Livestock Exchange, the Kansas City Chamber of Commerce, and many others.

We extend all of you a cordial welcome. We will do the best we can to provide a meeting in keeping with the splendid meeting that our friend Dr. McMahon has provided for us here in Phoenix.

Thank you. (Applause)
CONSTITUTION AND BY-LAWS
OF THE
UNITED STATES LIVESTOCK SANITARY ASSOCIATION

ARTICLE I—NAME
The name of this Association shall be "The United States Livestock Sanitary Association."

ARTICLE II—PURPOSE
The purpose of this Association shall be the study of livestock sanitary science, milk and meat hygiene, and the dissemination of information relating thereto, the unification so far as possible of the laws, regulations, policies and methods pertaining to milk and meat hygiene, and to the prevention, control and eradication of transmissible livestock diseases; to maintain co-ordination among the various livestock regulatory organizations, and to serve as livestock sanitary science clearing house between this Association and the following: The livestock owner, the livestock sanitarian, the milk and meat hygienist, the veterinary practitioner, the transportation and stock yard companies, the milk and meat producing and distributing companies, and various other interested agencies. The word "livestock" as herein used shall be understood to include poultry.

ARTICLE III—MEMBERSHIP
There shall be two kinds of members—Official and Individual.
The livestock sanitary departments of each state also the United States, and the Canadian, Cuban and Mexican governments, The Territories, Puerto Rico and the Virgin Islands shall be eligible to official membership in this Association and be represented on the Executive Committee by the livestock sanitary executive official.
Any person engaged in livestock sanitary work for federal, provincial, state, territory, county or municipal governments and any other person interested in livestock sanitation or milk and meat hygiene may be elected to individual membership.

ARTICLE IV—MEETINGS
The meetings of this Association shall be annual and special.

ARTICLE V—OFFICERS
The officers of this Association shall be: President, First Vice-President, Second Vice-President, Third Vice-President, Secretary-Treasurer, and an Executive Committee.
The officers of this Association shall hold office for one year or until their successors have been duly elected and qualified.

EXECUTIVE COMMITTEE
The Executive Committee shall be composed of the executive officer representing the livestock sanitary departments of the various States and Territories, the Chief
of the United States Bureau of Animal Industry, the Veterinary Director General
of Canada, the executive regulatory officer of Cuba and Mexico, The Territories,
Puerto Rico and the Virgin Islands, and the elective officers of this Association.

The Executive Committee shall constitute the administrative body of this Asso-
ciation and shall determine its activities and policies.

All recommendations and reports of officers and committees shall be referred for
consideration to the Executive Committee.

The First Vice-President shall be ex-officio chairman of the Executive Committee.
The Executive Committee shall elect yearly a Secretary-Treasurer for the Asso-
ciation. The Secretary-Treasurer shall receive such salary and allowance as may be
fixed by the Executive Committee.

The Executive Committee shall cause to be audited annually or oftener if deemed
necessary, the receipts and disbursements of the Secretary-Treasurer, and shall
have authority to hear and determine all complaints filed before it in writing rela-
tive to the conduct of any member; and shall have authority to accept or reject
applications for individual membership properly placed before them. Three nega-
tive votes shall disqualify for such membership.

ARTICLE VI—PROGRAM COMMITTEE

The President, the Chairman of the Executive Committee and the Secretary-
Treasurer and the Chairman of the respective committees shall constitute the Pro-
gram Committee. It shall be the duty of the officers of the Program Committee to
make the necessary arrangements and provide the program for the annual and
special meetings.

ARTICLE VII—DUTIES OF OFFICERS

1. President: It shall be the duty of the president to preside at all meetings of
this Association; to appoint all committees excepting the Executive and Officer
Fraction of the Program Committees; to call special meetings of the Association
whenever he considers the holding of such meetings necessary for the good of the
livestock industry or upon the written request of five members of the Executive
Committee. The president shall be an ex-officio member of all committees.

2. First Vice-President: The first vice-president shall be chairman of the Execu-
tive Committee. In the absence of the president, he shall preside at the meetings of
the Association. In the event of the absence, disability or resignation of the presi-
dent he shall perform all duties of the president. He shall be an ex-officio member
of the Executive and Program Committees.

3. Second Vice-President: The second vice-president shall assume the duties of
the president in the event of the absence, disability or resignation of the president
and first vice-president. He shall assume the chairmanship of the Executive Com-
mittee in the event of the absence, disability or resignation of the first vice-president.
He shall be an ex-officio member of the Executive Committee.

4. Third Vice-President: The third vice-president shall assume the duties of the
president in the event of the absence, disability or resignation of the president, first
vice-president and second vice-president. He shall assume the chairmanship of the
Executive Committee in the event of the absence, disability or resignation of the
CONSTITUTION AND BY-LAWS

80 first and second vice-presidents. He shall be an ex-officio member of the Executive Committee.

82 5. Secretary-Treasurer: The Secretary-Treasurer shall keep an accurate record of the proceedings of the Association. Whenever authorized so to do by the Executive Committee he shall publish said proceedings and distribute them to the members of the Association. The Secretary-Treasurer shall also keep an accurate record of the proceedings of the Executive Committee and shall furnish a copy to each member of said Executive Committee. He shall forward to each Executive Committee member a copy of each regulation approved by the Association.

89 He shall keep an accurate account of all Association moneys received and disbursed. He shall also present to the Chairman of the Executive Committee a list giving the name, occupation and address of each applicant for individual membership for the approval of the Executive Committee. He shall perform such other duties as may be authorized and prescribed by the Executive Committee. He shall be ex-officio secretary of the Executive Committee, also an ex-officio member and secretary of the Program Committee. He shall be bonded for not less than ten thousand dollars.

97 ARTICLE VIII—AMENDMENTS

98 The constitution of this Association may be amended by a two-thirds vote of the members of the Association present and voting at an annual meeting, provided that the specific amendment to be acted upon shall have been presented in writing at a previous annual meeting and further provided that the amendment has received the approval of the Executive Committee.

BY-LAWS

103 ARTICLE I—ORDER OF BUSINESS

105 Registration.
106 Call to Order.
107 Report of Secretary-Treasurer.
108 President's Address.
109 Reading of Papers.
110 Committee Reports.
111 Discussion.
112 Unfinished Business.
113 New Business.
114 Nomination and Election of Officers.
115 Adjournment.
116 A suspension of the By-laws may be made by a two-third majority for the purpose of changing the order of business or to facilitate important business.

ARTICLE II—APPLICATIONS FOR MEMBERSHIP

119 Applications for individual membership shall be made in writing to the Secretary-Treasurer. The application shall give the name, occupation and address of the applicant and shall be accompanied by a fee of three dollars ($3.00), which amount
shall include the membership dues for one year. Applications shall be presented in proper form to the Secretary-Treasurer, who shall in turn submit them to the Executive Committee.

An individual member may be expelled for cause by the Executive Committee.

**ARTICLE III—Meetings**

The annual meetings shall unless otherwise determined not less than thirty (30) days in advance by a majority of the members of the Executive Committee, be held at Chicago, Illinois, during the time of the International Livestock Exposition. The place for holding the meetings in Chicago as well as the duration of said meetings shall be determined by the Officer Members of the Program Committee of the Association.

The place for holding special meetings shall be determined by the President with due regard to the wishes of the members of the Executive Committee, the subject matter to be considered, accessibility, and the information to be obtained. The notice of time and place of holding a special meeting shall be mailed to the members at least thirty days prior to the date fixed for the special meeting.

**ARTICLE IV—Quorum**

Twenty-five members of the Association shall constitute a quorum.

Five members of the Executive Committee shall constitute a quorum.

**ARTICLE V—Dues**

The dues for individual membership in this Association shall be three dollars ($3.00) per annum, payable in advance (on or before January 1st of each year) to the Secretary-Treasurer of the Association.

The dues for official memberships shall be fifty dollars ($50.00) each per annum, payable in advance (on or before January 1st each year) to the Secretary-Treasurer of this Association.
Proceedings
OF THE
FIRST MEETING
INTER-STATE ASSOCIATION OF
LIVESTOCK SANITARY BOARDS

Exchange Building
Fort Worth, Texas, September 27-28, 1897
The meeting of the Live Stock Commissions of the different states interested in
the dipping experiments which have been conducted at the Fort Worth Stock Yards
for some time, was called to order in the Exchange Building, Monday, September
27, 1897, at 10 o'clock, by R. J. Kleberg, of the Texas Board, who nominated Mr.
C. P. Johnson, from Springfield, Illinois, as chairman. D. O. Lively, of Fort Worth,
was chosen secretary of the meeting, and upon the roll call of the states the follow-
ing were shown to be present:

Illinois—C. P. Johnson, J. P. Lott, J. R. Goddard and Dr. C. P. Lovejoy,
Kansas—W. F. Weinshank, J. W. Johnson and Taylor Riddle,
Missouri—J. W. Hill and Dr. J. W. Connaway,
Nebraska—W. N. Babcock,
Cantelou.
Texas—R. J. Kleberg, W. B. Tullis, A. P. Bush, Charles Goodnight, W. W. Tur-
ney and H. H. Brooks.

The Bureau of Animal Industry was represented by Dr. Victor A. Norgaard,
Col. Albert Dean, Dr. Charles Blemer, Dr. F. T. Shannon and W. D. Jourdan.

It was announced that Dr. Gresswell, State Veterinarian of Colorado, would ar-
rive at 5:30.

Upon motion of Mr. Riddle, of Kansas, Mr. W. E. Skinner, general manager of
the Fort Worth Stock Yards, was called upon to state the purpose of the meeting.
Mr. Skinner stated that when he met the Sanitary Board of the State of Kansas at
Topeka, the question of a uniform system of inspection and quarantine was dis-
cussed and he asked that the proposed meeting of the sanitary boards, looking to
such conclusion, be postponed until such time as he could demonstrate to them
something of the results of the experiments he expected at the Fort Worth stock
yards, and he assured them that at that time he would endeavor to secure a repre-
sentation of the Bureau of Animal Industry to supervise such experiments. This was
acceded to and the meeting here is the result.

Mr. Kleberg moved that a committee on resolutions be appointed, one from each
state represented, and members of this committee be chosen by the delegates. Car-
rried, and the following committee was nominated:

Illinois—J. R. Goddard Texas—R. J. Kleberg,
Kansas—F. Weinshank Colorado—Dr. Charles Gresswell,
Nebraska—W. N. Babcock Montana—Dr. Charles Gresswell.

1 Addendum to the Twelfth Annual Report of the State Board of Livestock Com-
missioners for the State of Illinois for the Fiscal Year Ending October 31, 1897.
On motion, Dr. Norgaard was invited to make an address explaining primarily the dipping process. In substance, Dr. Norgaard said:

"It has been known for a long time that if southern cattle were freed from ticks, they can be shipped into safe areas at any time of the year; the question is and has been, how can this be done? Several years since Mr. Kleberg found that his cattle were considerably troubled with itch and it occurred to him to build a vat to dip cattle for this trouble, which he did. He discovered when dipping for itch that a number of ticks were killed, and knowing of the theory of the ticks communicating Texas fever, which was advanced as early as 1860 he went to see the then Secretary of Agriculture, (Rusk), and suggested to him the advisability of dipping cattle for the purpose of eliminating these pests. At Mr. Kleberg's solicitation, I was directed to go to Santa Gertrude's Ranch, where I was stationed between two and three years, where we continued to experiment with that end in view. Others took up the work, and finally the Texas Experiment Station, in conjunction with the Station at Columbia, Missouri, made some experiments, and last but not least. Col. Skinner took up the matter and that is why we are here. It became plainly evident while I was at Santa Gertrude's Ranch that ticks could be killed, but the question was, how to kill them without damage to the cattle. We dipped about 20,000 head of cattle at Mr. Kleberg's ranch and it was demonstrated to us that what would probably be effective on a small number would not always act satisfactorily on a train load. We found also that in the matter of injuring the cattle there is a great difference in the individuality of the animal, which is not confined to breed nor age nor to the color. The matter of using oil for dipping was introduced by Dr. Francis of the Texas Experiment Station, who used black winter oil in his experiments. It has been found that when applied by hand this oil is effective, but when used in the vat, in which three or four inches of the oil is made to float on the water, it has a detrimental effect on the skin and eyes and ruins the appearance of the cattle, especially those of light color. It also heats the cattle considerably, even producing a bad effect in that direction two weeks after application. It has been noticed that even after that length of time cattle exposed to the sun would loll out their tongues and pant considerably. I can say that the black winter oil kills most of the ticks, but it is not thoroughly effective. We discovered in the experiments conducted here that a clear lubricating oil has a superior effect to a black oil, which last is mechanical and does its work by so thoroughly enveloping the tick as to choke it. The clear oil we find has a chemical as well as a mechanical effect, and for the first time in our experiments we notice that a large number of ticks drop off the cattle while they are standing on the dripping board after having passed through the vat, and that the remaining ticks will die in from three hours to three days. I might say that the question which has always given the most trouble is the killing of the small ticks, which pass through a double moulting during which part of their existence they are covered with a thick, almost impenetrable skin or shell. The lubricating oil which is now being used in the experiments here has killed the small ticks effectively, but it must be remembered that it is hard to tell when they are dead, the tenacity of hold-
ing on being the best test as to when they are dead. It can be safely concluded that if, after rubbing the skin of the cattle with some instrument, such as a nail, the small ticks fall off, they are dead; we find also that the clear oil has been attended with small, irritating effects, and by a mixture of lard oil, with this clear lubricating oil, the irritating effect is largely removed. It has been definitely determined that it would not be safe to send cattle into the uninfected areas after one dipping; this was when we had about four inches of oil on top of the vat, and this can be obviated by six or eight inches instead of four. It is the intent, in the event that it is demonstrated that the dipping is thoroughly successful, to dip, hold the cattle for two or three days, dip again, load them on thoroughly cleaned and disinfected cars and ship to the grazing grounds, or it could be possibly arranged by dipping at home, or on the ranch, in the solution recommended, and then again under official supervision at Fort Worth.

Dr. Connaway, of the Missouri Experiment Station, stated the results of the dipping experiments conducted by the Missouri and Texas Experiment Stations and pledged the cooperation of his people with those of Texas in further investigation and experiments. He stated that the Missouri Experiment Station would take cattle dipped at the Fort Worth Stock Yards and expose them to natives and such other tests as might be considered advisable. He would like to hear from Col. Dean on the quarantine side of the matter.

**REMARKS ON DATES OF OPEN SEASON AND THE EFFECTS OF DIPPING AGENTS ON CATTLE**

**COL. ALBERT DEAN**

**INSPECTOR, United States Bureau of Animal Industry**

**COL. ALBERT DEAN** said: "Mr. Chairman and Gentlemen: We have realized, in enforcing the regulations concerning cattle transportation, in the Bureau of Animal Industry, that the 15th day of February is not early enough to begin the quarantine against Southern cattle in districts like Oklahoma and Texas; that where the temperature is so high, early in the season, and the winter is short, and as we have had recently a very mild winter down here, these regulations have not been effective to resist Texas fever; that when cattle are brought across the line immediately before the 15th day of February, they carry the infectious principle with them, distributing the ticks, and that they are only in a very small degree less infectious than if they came directly from the ranches, and that there are some steps necessary to be taken to lay this matter before the department, that they may change this date. So far as the dipping is concerned, I know little or nothing about it. As to the experiments that have been made between the experiment station in Texas and the experiment station in Missouri, I have inspected both shipments for the last two years, and I know that the conditions are practically as Dr. Connaway has stated. In the dip last year, when carbolic acid was the dip, I know that in passing Parsons on the M., K. and T. road, where I inspected both bunches, the eyes of the animals in the last year's shipment were badly affected; that is to say, the eyes of a great many of them had turned white, and we thought were all going to go blind, and consequently the Bureau of Animal Industry was notified of the fact and I was authorized to go to Columbia eight or ten days later and see what the effect would
be then. I would not have known they were the same animals to look them in the eyes; nothing the matter with the eyes eight or ten days later.

"This year on the 8th or 10th of June, I examined as closely as I could in the car the fourteen head that were dipped and shipped out. This was thirty-four hours after the dipping. The cattle stopped at Parsons to take feed and water in the car, and I made as careful examination as could be done in the car. I was not able to find a living tick on the double dipped cattle. The cattle were all in one car, but the double dipped had the bushes of their tails cut off. On the single dipped cattle I found several ticks. I pulled off probably seven or eight living ticks and put them in a box but they soon died. They did not lay any eggs. They died within twelve or more hours. Of course, I was of the opinion then that the black oil had done the work. I will say now that I will corroborate the opening remarks of Dr. Norgaard, as to who is entitled to the credit of the dipping to kill ticks. In a personal conversation with the late Secretary Rusk, he told me that R. J. Kleberg, of Texas, made the first suggestion looking towards the solution of this question; that he said to him, 'Mr. Secretary, if the tick carries this disease, as your investigation seems to show, I will get rid of the tick.'"

Answering questions propounded by Mr. Bort and the chairman, Dr. Norgaard said the oil used in his experimentation was what is termed neutral oil, between lubricating and illuminating; that he had submitted the oils to chemical examination in order to determine whether the oils contained any quality which might have this unfavorable effect and which might be excluded by some chemical process, but failed to find the free acids or free alkalies, or, in fact, to find anything but the pure oil, and consequently it must be supposed that this slight burning effect is a feature of the oil itself. Mr. Bort described an oil product of petroleum, obtained between the gasoline and the lubricating oil, including the neutral oil spoken of by Dr. Norgaard. Dr. Norgaard said he had not tested this oil; that it was volatile and he supposed it would burn the cattle badly. Mr. Bort further explained that this is called distilled oil, between the light and heavy oil, and includes 120, 150, 175 and neutral oils.

Then adjourned until 3:30 p.m.

**AFTERNOON SESSION, 3:30 P.M., SEPTEMBER 27, 1897**

The Chair—"Gentlemen, the hour has arrived to which this convention took a recess. The convention will now be in order. What is the pleasure of the convention?"

Mr. Kleberg—"Mr. Chairman and Gentlemen: I believe we will expedite matters by going ahead as well posted as possible and as we have before us Dr. Dean, under whose supervision this matter has come, I would ask him to give us a short outline of these things, with reference to Texas fever, the tick and the quarantine, and the result of the present quarantine regulations, so that we may know how to act. There may be some among us who are not familiar with everything that has occurred, and I move that the gentleman be asked to address us on the subject."

The motion was seconded by two gentlemen, and the Chairman said; "If there is no objection, it will be taken as the sense of the meeting. Col. Dean will kindly respond."
"Mr. Chairman and Gentlemen: It seems to me that it would take an hour's time to discuss the theories that have been obtained from time to time in regard to this disease commonly known as Texas fever. Very many of them have long since outlived their usefulness. From a personal experience of over twenty-one years, we have found that every outbreak of fever in the north, or in our experience in the northern states and Canada, and for ten years' official service in the same line, we have proven the same thing over and over, and the experiments that have been made by the Department of Agriculture, verified by the various experimental stations throughout the states, have left not the shadow of a doubt but what the tick is the disseminator of the Texas fever. Before the experiments that have been recently made, and the best of which you have just witnessed, our only hope for disinfection for pasture or ranch was the winter. Now this is one of the most convincing pieces of evidence that it is the tick that is the carrier of the disease, that cold weather, a long continued period of cold weather, is always efficacious in disinfecting ranges and pastures. Now, with our hopes concentrated on the success of the experiments that you have just witnessed, and until these can be verified and perfected, and arrangements made by the department for interstate traffic, we must fall back on nature for a disinfectant and for a safeguard; and the last two winters have proven that the winter after the 15th day of February is not efficacious in disinfecting pastures and ranges south of the south line of Kansas and from the fact that the act of Congress under which the Secretary of Agriculture derives his authority, provided that where this quarantine is ordered, the Secretary is simply authorized to place the quarantine line on state and territory lines; that where the states and territories permit different lines and make regulations or have laws sufficient to back them up, and if that is satisfactory to the Secretary, he is authorized to adopt these lines established by the state or territory; and under that authority the line is deviated from the state or territory lines under these rules, amendments and regulations concerning cattle transportation; so that we have a line almost diagonally on county lines through the territory of Oklahoma and protecting the Panhandle and West Texas. Now, as the Department has practically cooperated with the state and territorial authorities on these various lines, we believe—at least I believe—that the first steps to be taken should be to prepare a memorial address to the Secretary, from this meeting, from the representatives of the states at this meeting, signifying the dates from and to which this quarantine would, in their opinion, be efficacious to protect this southern country. Texas in her northwest, in the Panhandle and on the plains, has raised cattle, and the prices which they command in the markets have established their reputation as equal to any feeders; but in order that that reputation may be sustained, in order that this confidence may be sustained, there is something to be done. We understand that when they come to market, they are free from infection, and we believe it is known, and I think that any man that has had any experience in the business will agree with me, it is necessary to make a change in the dates, and it is my opinion that this is within the duties of this committee that you have appointed at the first meeting, to designate to this meeting what these dates shall be. Further than that, I believe that I have nothing more to say."

A Member—"Has the fever line extended further north than it was originally?"
PROCEEDINGS OF FIRST MEETING OF INTERSTATE

Col. Dean—"The tick has been carried north and found favorable surroundings and stayed there. It appears to be built on lines to accommodate itself to different climates, and we do not know exactly how far north. He stayed all winter one time up as far as central Kansas, and infected that district one year, but never held over the second year."

A Member—"But I mean the general line in Arkansas?"

Col. Dean—"According to my personal recollection, I believe the fever line has extended north 100 miles in twenty years."

The Chair—"Is it not a fact that the government has placed the line farther south year by year?"

Col. Dean—"To some extent that is true."

The Chair—"They moved it year after year?"

Col. Dean—"Yes, it has been changed. Originally we thought we ought to keep fifty miles from the positively infected country. Now, when the people in these counties appeal to us, I undertake to try to help them, and recommend in many cases an extension, and up to two years ago that was practically right, but for the last two seasons they practically had no winter in the latter part of the season, and the southern cattle taking the ticks up there brought the fever this year worse than it ever did before."

The Chair—"Gentlemen, these proceedings are informal, but for the purpose of information, we will continue in an informal manner, if there is anything further to hear."

Col. Dean called upon Mr. Charles Goodnight to speak, who, responding, said: "Mr. Chairman, Gentlemen—It is a fact that what we used to consider safe lines for preventing fever, have proven the last two years unsafe. For instance, the winters, as the gentleman remarked a moment ago, have been so mild that these ticks have not been killed out. We used to keep the ticks out by keeping the cattle away. Now it is a fact that the line will have to be changed. There is no dodging the issue. While I have not lost anything, my neighbors have, because the winters are not sufficiently cold."

Mr. Kleberg—"Would it not be better to change the line? Would not that be more efficacious?"

Mr. Goodnight—"That is it; to change the time. I don't see how we could help ourselves by changing the line, but we must change the time of the beginning and ending."

The Chair—"You are speaking of the line in Texas?"

Mr. Goodnight—"Yes, I have nothing else in mind, only our line here that I know something of. It looks like to me to make it absolutely safe, it is going to run down to pretty near nothing. Col. Dean can give you more information, I think, than I can, but it looks like to me that it is not going to leave over 45 or 60 days. I don't say that to keep out anybody's cattle, but I speak of it as a fact."

A. P. Bush, Jr., President of the Cattle Raisers' Association of Texas, was invited to speak, and responded as follows: "Mr. Chairman: I do not think that I can say much on this line, because my experience is not very extensive. You have had some trouble with Texas fever. We have had some in our country, and of course I have some ideas about the line and
about the best remedy, but if there is a committee that has that matter in charge
with respect to Texas, I would like to talk with them when they take that question
up, especially as applying to my country, and the West and South. Farther north
and east I don't know the conditions, but in our country I am quite familiar with
them."

Mr. Kleberg—"Col. Dean has suggested that this meeting will probably under-
take to pass some resolutions in regard to fixing the time or changing the time, and
of course as to our Texas board it would make very little difference what they
thought; it would cut a very small figure in the case, and it is as well to satisfy those
gentlemen we deal with and the gentlemen on the other side of the line in Texas.
Now if you can give us some ideas about the time, I think they will be very valu-
able to us."

Mr. Bush—"Well, that is what I say. I will be glad to state these matters before
the committee who will report on that question, but I am satisfied, as Mr. Goodnight
has told you that the time will have to be limited. This last year, in our particular
country, cattle were brought in from the south as late as the law would allow, and
we have had considerable infection, but it scattered around from cattle brought
in as late as the first of February. I don't know how long the tick will be preserved
in cold weather, but I think we should have cattle brought in early enough to shed
the grown tick, or to allow the small to develop and shed and hatch if a warm
spell comes and then be killed. According to my theory of it, I don't believe that cattle
should come in at a period that would not cause a lapse of sufficient time so that
we could have cold weather, say 30 or 40 days freezing weather. Now with us we
may have freezing weather along the latter part of January and first of February,
and sometimes later in February, but this year the last freezing weather we had in
our country, real freezing weather, was the last of January. Our people, I think, are
very much disposed to have the time of year later than the first of January for our
country."

Mr. Kleberg—"Let me ask you another question. Do you know of any out-
breaks that have occurred from cattle that have been brought in in the fall,
November?"

Mr. Bush—"No, sir; I know of none at all. I took some in myself in November,
and put them in a small pasture. I doped a lot of them as much as possible, had
some ticks on them, and I had that small pasture divided off for milch cows and for
old steers, and I have never had a ticky animal or a case of fever at all, and I know
of no case in that country where cattle were brought in and kept to themselves or
kept from cattle brought in later; no fever developing from anything that came in
in November. If there is a case, I don't know it."

Mr. Kleberg—"Could the time be extended from the first of November say
the 15th of October to January, and be safer than the present time?"

Mr. Bush—"Yes, I think so. The 1st of November perhaps might be safe, that
is, that would give us, before the tick could do any damage, as we know, a period
of thirty to forty days of cold weather and possibly longer. That would throw us
until after the first, about the middle of December, at which time, I think
the weather, as a rule, is too cold to permit the ticks to hatch out and do any damage.

"Now, as to the matter of line; I agree with you in the idea that there must be
some margin. In other words, that where cattle are perfectly safe and clean and free, and show that they are in that condition to go to market, that there should be a strip south of that to hold out cattle from coming in there and continuously bringing in these ticks year after year, which keeps us infected. We find it an impossibility, with an arbitrary, or just an imaginary line, to prevent the occasional slipping over of some man who wants to take the advantage and get up a lot of cattle and get the benefits. Now a margin would not hurt but would prevent the bringing in of southern cattle, and it would possibly free that country from infection, for the tick is not indigenous there, and it does not hurt those people, and I think with that much margin it will keep them out,—the people in there who want to be protected and who want to get the final benefits will keep those cattle."

MR. KLEBERG—"You mean to have a double line?"

MR. BUSH—"Yes, have a special quarantine south and north line."

THE CHAIR—"How would it do to have a neutral strip on which cattle could only be admitted on inspection—cattle north coming in without inspection, those south being prohibited except under the regulations, and the neutral strip to be admitted on inspection. How would that work?"

MR. BUSH—"I question the theory of letting them in on inspection."

THE CHAIR—"I say, considering this a territory considered safe but to put the line north of that, because of the danger of running the cattle across there."

MR. BUSH—"That might do if you make the strip within the safe area."

THE CHAIR—"That is my suggestion."

MR. BUSH—"I will tell you why. I have had experience along that line this summer with cattle in my neighborhood where the cattle were carefully inspected, and I think it is a fact from the nature of the tick, its growth and development, if you take a lot of cattle and put them in there, that are all full of ticks, and say the most of them may be grown ticks, they may have very few small ticks on them at all. Well, they will drop off. It takes 30 or 40 days for that tick to hatch and get round again. In the meantime, these animals may be perfectly clean apparently and in fact perfectly clean, and we had cattle inspected just that way and declared clean and the inspectors examined them carefully and some of the cattle were moved out, and about the time they got ready to move, shortly after that I looked at some of the cattle from a horse—without inspection—and saw no evidence of ticks on them at all, and yet in a little while every animal in that bunch was full of ticks. They clean off and apparently a few might escape. So I don't know if it is an infected area, whether the inspection would be safe."

MR. KLEBERG—"The ticks are so small you could hardly see them."

MR. BUSH—"Yes. Now, if it was a safe area, that would possibly be all right; it might be done that way. I think there is room for some considerable change in regulations in these respects, and these members in Texas, with the experience they have had, will be able to solve that question. I have great confidence in their experience and their interest in the matter and I believe that when they agree upon some measures we can cooperate with them, and I hope the committee will take it up with these points in view when they begin to work on this line. You cannot get the full benefit of the Texas line from these inspectors in Texas this year. We will have to have a line of special quarantine counties or we are going to keep moving
the tick line north, I believe. As long as we keep pushing it and bringing them in, especially with improved ranges and increasing protection and covers for them, I am sure that they will keep coming a little further, but I believe that if we hold them out, that they are not indigenous to the western prairie country. I don't think the tick is indigenous there, and I don't think he will continue to develop there if we keep out animals that bring them in; and we want to protect our country. I believe that it is to the best interests of all parts of Texas and the best for the interest of other states, and we want to work harmoniously together."

W. W. Turney—"Mr. Chairman: I come from the counties west of the Pecos River, around Fort Davis. Our altitude is something like three to five thousand feet. There are several of those counties west of the line and we consider them safe area. We have had some trouble, however, this winter. Cattle were brought in there from Levaca County and Gonzales as early as the 21st of January and imparted fever. We have never had any trouble except from cattle brought in from that part of Texas east of us and east of the line is the county Val Verde and the County of Crockett. We have never had any trouble, so far as we know, from any of those cattle, but cattle brought from further east have given us trouble this winter and other winters.

"Now, so far as the time is concerned, we are satisfied that it should be shortened. The 15th of February is much too late. It permits ticks to breed and to live. If the time were shortened to the 15th of December, it would suit us much better. Perhaps we could get along with the time made the first of January. I doubt that some. We know that our country is safe because of its altitude and cold winters, and we have never found any trouble with the line. We think the location of the line is where it ought to be, because there are several counties east of us that we believe a safe area. We are satisfied that Pecos County is a safe area. It is in the special quarantine. We believe that Pecos River east of us would make it perfectly safe for our section. The trouble is not with the line but with the time of year that cattle are permitted to come. As I said, these cattle that come in on the 21st of January, imparted fever. There were not many of them and not many deaths. About 25 head, I presume died of native cattle. Now the change we are insisting upon is not one of line, but we hope that there will be a change of time, so that it will be much earlier than it is now. If that be done, our country would be perfectly safe.

"Now, as to moving the line north, it seems to me that it does not matter where we move the line; you are always going to have trouble with those next to it on the south. If you moved it to Kansas, there would be dangerous cattle brought up to the south line and mingled to some extent with cattle above the line. You cannot prevent it unless as the gentleman suggests, you have a special quarantine either north or south of the line. Otherwise, you will always have trouble with your line. If you take the line to Colorado you will have trouble. I don't care where you take the line, right up against it will be cattle from the southern country with the tick; so that the cattle men of our section are insisting that you change the time, but leave the line as it is, because they know that it is safe."

Mr. J. P. Lott—"Mr. Chairman: I am not familiar with the line as it runs through the Territory and Texas, but the line through Arkansas and Tennessee has given the people of Illinois a great deal of trouble this season. In fact, nearly
all of our outbreaks are attributable to these two States; we have traced one or
two to Texas, I believe, and it has given us so much trouble that we have been
forced to quarantine against the whole territory of Tennessee and Arkansas, and I
hope this committee when the question is taken up by them, will fully consider the
matter and look into that subject. We feel up there as though the line should be
moved farther north, especially in those states. As regards Texas, I am not so fa-
miliar with the question.”

MR. KLEBERG—“What time does the line open in those states?”
MR. GOODNIGHT—“Fifteenth of February.”
MR. LOTT—“Same as here.”

MR. J. W. JOHNSON, of Kansas—“Mr. Chairman: I don’t know as I have anything
to add to what has already been said. I heartily agree with the gentleman from West
Texas, that it is a question of the time, but as Captain Bush has suggested putting
the time back to the first of November, there is one thought that this meeting should
take into consideration. In our State, Kansas, we don’t allow them to come in until
the 1st of December. Suppose you open that and allow the southern cattle to come
into your country the 1st of November; I don’t know what our people would say
about allowing cattle to come in there after that until December, and it might cut
off a good many of our people. For instance, our people come down and make large
contracts and a great many from our State have got their cattle contracted in the
Panhandle, and we expect to take them out in the next 30 or 40 days, on account
of pasture. If we make a contract for cattle to go out on the 1st, 2nd, 5th or 10th
of November, out of the safe country to the Panhandle and the Panhandle would
open up to these southern cattle countries, in the meantime we would probably
have to shut down on their coming in while we now allow them to come.”

MR. KLEBERG—“Let me suggest that we could not change the time of the season.
This is for the future; the next season. Then the contracts could be made with ref-
erence to that.”

MR. JOHNSON—“That is right.”

MR. KLEBERG—“If we were to change it now it would create trouble and
confusion.”

MR. JOHNSON—“I like the suggestion of all the gentlemen as to changing the
time. You must cut that time shorter or our people are going to be fearful of what
seems to be now unsafe. They are now very fearful and if you cut that time down
you will get great encouragement from our state, and I want to say to the people
of Texas, the fact that they have taken this in hand as they have in the last year
and the year before last has restored a great deal of confidence to our people. We
believe you are doing everything possible under your rules, regulations and laws.
Now, if you will cut that time down to the 1st of January or the middle of January,
the fact that you do cut that time back will give confidence, and the more you cut
it back the more confidence we will have that you are going to keep your infected
cattle from our healthy cattle, and it will be the greatest help to us, to you and to
the country at large. I take it the line is, perhaps nearly right. I don’t know but
there may be some places the line ought to be changed, but the right thing will
be to continue that on.”
Mr. Turney—"Don't you think we can fix the time to stop the cattle from coming in without hurting anybody? Say fix the 1st of January?"

Mr. Johnson—"Right in that line we have had cattle coming in as far north as our State the 1st of February. There were a good many cattle; I know of several bunches of cattle that came in—some Louisiana cattle, Texas and Arkansas cattle that came to our State the last days of January, and I know that I watched it very closely and we have not had an outbreak of fever in our State from cattle that came in January, though I know of cattle that brought ticks in with them, and yet there was no outbreak from them. There were two of those cases I know that were not a very good test, in fact, when they brought them in there, they put them in a feed lot to feed them; it was in the winter, cold weather, and they fed them until warm weather, until grass had come, and turned them off to grass pasture. They turned cattle in there to feed and water and it caused no trouble. We are inclined to believe down there that, from the number of cattle that came in that way, our people got very hungry for cattle along in January, and knowing the time when the line went into effect, they could not bring them after the 1st of February, the cattle came in there until the last day and quite a number came in in January, and there has been no bad result we ever heard of."

Mr. Kleberg—"These quarantines go the 15th of November."

Mr. Johnson—"With us it is the 1st of December."

Mr. Kleberg—"The national time goes out the 15th of November. Then they fix the time when it shall stop and in these new regulations we want to fix the time the first of January."

Mr. Johnson—"Our law says they shall not come in until the 1st of December but our Board last year took it upon themselves to allow cattle to come into our State after the 16th of November. We passed that resolution on the 15th day and gave it out the next day, so that they could come in after the 15th of November. I want to say that there is no bad results from that, and there was a fair test. I watched very carefully and there were no bad results from the cattle that came in in November to our State last year, and our Board recommended our Legislature that they so amend the law that cattle could come in on and after the 16th day of November. One reason was we thought it was safe, and another was to conform to the Government and some other states, and I think it would be better if all the states, where they can, would conform to a certain time. I think you take the southern part of Missouri, Illinois, Kansas, Colorado, we are all about on the same line and could all conform to a certain time for cattle to come north, and perhaps Texas would be safe in conforming to the time in the fall, but it seems to me Texas has got to cut her time earlier in the winter than we have, because she is farther south in a warmer country. I am speaking now of the Panhandle country, and if you allow southern cattle to mix in your pastures, our people might say we don't want them because they have come in contact with southern cattle."

Mr. W. B. Tullis—"You admit them anywhere in the State after the 15th of November, don't you?"

Mr. Johnson—"Only last year. Before that it was the 1st of December."

Mr. Tullis—"Coming from the Panhandle as well as down here?"
MR. JOHNSON—"Yes, I think that is all right."

MR. TULLIS was invited to speak and said:

'I don't think I have anything to say, except that we would like to get them into our safe area as early as possible. Of course they are not going to let them in there until December if they are below the line, consequently if they are above the line, it will be just the same. You see our cattle when they cross the line have got to go on the open range without feed; therefore, by cutting it back that short time, if we can give them a little earlier time to get in there, that is enough."

THE CHAIR—"I would like to hear from the gentleman from Missouri."

DR. CONNWAY—"Missouri is interested in both the line and in the date, as I understand it. We have three quarantine lines to guard. The government line, I think, comes down below two of the northern county lines of Arkansas. Then we have in our State our own quarantine line fixed on the State line and Arkansas. There is a quarantine against one tier of her southern counties less one county, and all this results, I think from the inability to protect the state line and the government line."

THE CHAIR—"Is it a fact that there are ticky cattle in those counties of your state, tick infested cattle?"

DR. CONNWAY—"Yes, but we claim that they were brought there from Arkansas."

THE CHAIR—"That is the reason that I asked the question. We had an outbreak in Illinois a few weeks ago, and the best evidence we could get as to the origin of the cattle was that they were shipped from Chadwick, Mo., from an adjoining county to one of those that Kansas quarantines against."

DR. CONNWAY—"We don't believe that it is an infect area at all."

THE CHAIR—"Do your cattle take the fever there?"

DR. CONNWAY—"Yes, and we would like very much to see the government line made on the state line between Arkansas and Missouri. I believe it would result in the better enforcement of quarantine matters. One of our own judges a short time ago threw a case out of court upon the plea that we could not stop interstate commerce, and we are having a good deal of trouble from that now. Of course the matter will be carried further, to test the question whether we can keep out cattle from the northern tiers of Arkansas. I believe, too, that the time of quarantine should be closed a little earlier, say about the first of January. I think that is the conclusion, approximately, is it not?"

THE CHAIR—"Yes."

DR. CONNWAY—"And that we might open up a little earlier in the fall. Last year we had an outbreak as late as about November 26th, I think it was, but this did not come from cattle that were brought in a month earlier, but came from stock yards that were probably infested much earlier in the season, when the weather was quite warm, and those ticks had no doubt been there for a couple of months; so I think it perfectly safe to open up a little earlier and we would like to see it closed up a little earlier."

MR. JOHNSON—"What is your time now?"

DR. J. W. CONNWAY—"Just the same; November."
Col. W. E. Bolton, of Oklahoma, was called for, and said:

"Mr. Chairman and Gentlemen: I am authorized by the Oklahoma Association to say that the line suits us where it is, but the time is too short that is, we want the time of coming in limited to January 15th, if not the 1st. We were in favor of January 15th, but if it suits the Board, suits the condition best—to open it on the 1st of January—or close it, rather—that would suit us. We have made every effort, as Col. Dean knows, in Oklahoma to comply with the regulations of the government. Our legislature has kindly furnished us with a special act, and we have three inspectors and have taken every precaution to guard the line. We believe we have no infection existing above the line, except where it is communicated by one or two cases from the safe areas of Texas which is now under quarantine by the Texas authorities, and we believe that the winter coming will stamp that out effectually and that we can take care of the infection in that country so far as it has developed; no serious cases developed and all the infection found has been quarantined, and the corrals quarantined and yards looked after. We have an active, organized body looking after the matter, and, in accordance with the suggestions of Col. Dean, we opened the line through our territory, following the plan of the Texas people last year, when the line was thrown around Texas and Oklahoma both, and we are preparing to maintain the Texas line where it is, we believe with good results. I will state we are watching the effects of the dip here, and we may close the line entirely after that has become successful and admitted, but until that time we would like to have the line where it is, and we promise to take care of the line for Oklahoma."

Mr. Johnson—"I would suggest that our people recommend that the government (if it see fit) put the line back on the Missouri line instead of taking in a part of Arkansas above the line. It makes trouble and they come across part of Arkansas and come in there and we find it is making much trouble for the Missouri people and also for us too, and I hope this Committee on Resolutions will not forget that fact, and ask them to make that change and put it back on the line between Arkansas and Missouri. It is already on the Kansas line."

The Chair—"I believe that it is a fact that there is no authority in the State of Arkansas in the nature of a Live Stock Sanitary Board?"

Dr. Connaway—"No."

The Chair—"I will say our Board wrote to Secretary Wilson a couple weeks ago, urging him to take action with reference to Tennessee and Arkansas, the same as our Governor did, making our lines the same, and he took the matter up and I received a telegram from him a few days ago to notify the Governor of Arkansas from what points tick infested cattle were shipped beyond the line—indicating that he was going to take some steps in the matter—and I gave him the information. There were probably a dozen shipments of tick infested cattle in Arkansas, sent north to the National Stock Yards; at least that many were discovered before they got into the northern division and sent to the southern division."

Mr. Kleberg—"Mr. Chairman: I think we have had full information and there don’t seem to be any difference of opinion; I would therefore offer this resolution: That we ask the Secretary of Agriculture, in fixing the time for the next year's
regulations—These regulations, I understand, are fixed on the 15th of November—and, to use a practical phrase, we will not monkey with the present regulations up to the 15th of November, but we will pass a resolution here asking the Secretary of Agriculture that in fixing the regulations for 1898, he fixed the time to commence with the 1st of November and end on the 1st of January, and leave the line as it is with the exception of the line between Arkansas and Missouri, and put that on the state line, and in Tennessee and Kentucky the same,—on the north line of Tennessee.

"I believe it is unnecessary for us to go before the committee with that. We are not in very large body here, and I understand that the Kansas people have to return in the morning, some of them, at least."

MR. JOHNSON of Kansas—"I offer as an amendment that that be referred to the Committee on Resolutions."

THE CHAIR—"The Chair hears no second, so far, to the original motion." (Said motion was thereupon seconded.)

THE CHAIR—"Gentlemen: The motion is that resolution be adopted by this meeting recommending that the Secretary of Agriculture, in establishing next year's regulations, place the time at which cattle may be admitted north of the line on the 1st day of November, and the date that they shall cease to be admitted on the 1st day of January, and that in fixing the line, all of the States of Arkansas and Tennessee be placed south of the line."

MR. KLEBERG—"That is it."

MR. JOHNSON—"Now I offer an amendment that this be referred to the Committee on Resolutions."

THE CHAIR—"It is moved this resolution be referred to the Committee on Resolutions for report."

MR. H. H. BROOKS, of Amarillo, Texas—"Mr. Chairman: I would like to speak of the section from which I come. We are up on the plains. The elevation where I live is 3,700 feet. I know that there are hundreds, if not thousands, of stock farmers who are making arrangements to ship cattle just as early as possible. Up to this time they have been moving cattle there from the 15th of November to the 15th of February. That is well enough. We watch very closely the moving of cattle into that country, and I know of one case from bitter experience, a herd of cattle being moved over the line on the 15th day of November, and the date that they shall cease to be admitted on the 1st day of January, and that in fixing the line, all of the States of Arkansas and Tennessee be placed south of the line."

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MR. KLEBERG—"That is it."

MR. JOHNSON—"Now I offer an amendment that this be referred to the Committee on Resolutions."
before the severity of winter and I do hope that if it is found advisable to change
the time (which I believe it should be) that you will extend it, making it earlier
in the winter, as there is no danger whatever of cattle that are shipped in, say from
the 1st of November on, but there is danger, and all the outbreaks of fever that
have been in the Panhandle this year have been caused by the cattle that are being
shipped in very late. Where the cattle that are brought in in November and De-
cember, there has been no outbreak from them; and in justice to a large body of
men, hundreds of whom are looking forward to moving in cattle this winter, I do
hope you will make it the first day of November instead of the 15th. This will give
them two weeks in which to prepare, and it would be a boon to us if you will do so.”

The Chair—“The motion is upon the amendment, which is to refer this resolu-
tion to the Committee on Resolutions.” (Carried.)

The Chair—“The question recurs upon the motion as amended.” (Carried.)

Mr. Skinner—“Mr. Chairman: In order that no disrespect may seemingly have
been shown the states named by this resolution, I would say, in inviting the different
states to this joint meeting, I had no knowledge of the existence of Sanitary Boards
in those states; I feel that they are equally interested, and I would like to have it
as a matter of record, at this meeting, that they have not been slighted on purpose.
They are equally interested with the states and territories here represented, and I
should like very much to have them here, and to that end I would like to make a
motion that our present chairman be made honorary chairman of the Sanitary
Boards, with a view to compiling and arranging a statistical record of the states
and territories that have Sanitary Boards, with list of their officers, so that in the
future we may know how to reach them; that our present Chairman and our present
Secretary be retained until this thing is completed; that they be asked to make
equal arrangements with other states that are trying to protect themselves in these
matters.” (This motion was carried.)

Mr. Lott—“Mr. Chairman: As I said a little while ago, most of our trouble has
come from the States of Tennessee and Arkansas, with the exception of only two
cases, that we could trace the infection, and one of these cases came from a point
in Midland County, I think, I understand that the Kansas folks are quarantining
against that county particularly. Is that it?”

Mr. Johnson—“Howard.”

Mr. Lott—“I would like to know whether they have any trouble from there or
not?”

Mr. Johnson—“We have had an outbreak in our State. Did you say
from Midland?”

Mr. Lott—“From Midland, yes.”

Mr. Johnson—“Midland County is not quarantined.”

The Chair—“Midland County is just north of the line.”

Mr. Johnson—“It is two counties north of the line. It is not quarantined.”

A Member said, “The trouble in our State was from Mitchell County, just
north of the line.”

Mr. Lott—“I would suggest to the committee, in considering the matter of
changing the line, the eastern part of it, to take that matter into consideration, as
the Kansas folks have had trouble from down there and we have also, very serious."

Mr. Skinner was asked as to future dipping tests, and said:

"There will be another test tomorrow, of other material, and another test on Wednesday. I was informed, before coming into this meeting, that two or three gentlemen, representing very important northern states in this matter, had determined to go home tomorrow morning. I would like to ask that the expression of this meeting be that no one visiting Texas from these northern states, leave here at least before Thursday night—Wednesday night anyway. It will be impossible to give you an actual demonstration of the dipping process before Wednesday night. You will not be able to get any results before Wednesday evening, to know where you are on this proposition."

Mr. Kleberg also urged that the gentlemen in attendance remain until Wednesday or Thursday, for the reason stated by Mr. Skinner. After further discussion by the Chairman, Mr. Riddle, Mr. Babcock and Dr. Connaway, it was understood that the representatives of the Boards would remain over to ascertain the results of the dipping.

Mr. Bolton suggested that stringent legislation be asked in the various states, providing penalties for illegally crossing the quarantine line.

It was decided, upon motion, that when adjournment should be had, it should be to 9:30 tomorrow morning, and the Committee on Resolutions was requested to report at that hour.

Mr. Pennington thought the rules and regulations of the State and National Boards should require that a special seal be placed upon cards loaded with cattle bound north, to guard against the unloading of cattle between points of origin and destination, except at the regular feeding stations. This matter was discussed, and the meeting then adjourned to convene tomorrow at 9:30 a.m.

**MORNING SESSION, SEPTEMBER 28, 1897**

Some time after the prescribed hour the convention was called to order by the Chairman.

The Committee on Resolutions presented resolutions with reference to time of quarantine and the line, and after a few verbal amendments the same were, upon motion, submitted for adoption, as follows:

**RESOLUTION 1**

*(Line and Open Season)*

WHEREAS, In view of the fact that Southern or Splenetic fever has been communicated to cattle north and west of the quarantine line, as fixed by the Department of Agriculture, by Southern cattle which have been allowed to cross said line as early as February 1, and

WHEREAS, The opportunity for the development and communication of southern or splenetic fever is very remote from cattle which are allowed to cross the line after November 1st, by reason of the advent of cold weather so soon after that date; and,

WHEREAS, Numerous cases of southern or splenetic fever have been developed within the present year in Illinois, Missouri and other states by the transmission
for grazing and feeding purposes of cattle from the states of Arkansas and Tennessee, or parts of said states lying north and west of the present quarantine line as fixed by the Department of Agriculture; and,

WHEREAS, For the better protection of the cattle of the states which have or are likely to sustain loss by the transmission of cattle liable to spread southern or splenetic fever infection; therefore, be it

Resolved, that this Convention of Sanitary Boards request the Secretary of Agriculture to make the time for closing the quarantine period for 1898, January 1, and that the time for opening the same be fixed for November 1st. Be it further

Resolved, that the location of said line remain as it now is, with this exception: that the States of Arkansas and Tennessee be placed south of said line.

Mr. Brooks, of northwest Texas, said that the dates of November 1st to January 1st, instead of November 15th to January 15th, would better suit the conditions of his section, and in this Mr. Tullis concurred.

Col. Dean was of the opinion that it is practically impossible to bring southern infection north of the south line of Kansas after November 1st.

Dr. Norgaard's opinion was asked, and he said he was not sufficiently informed as to the climatic conditions upon or near the line with reference to Texas and Kansas to offer any opinion.

In answer to an inquiry, Col. Dean said:

"I do not think I am able to state the lowest temperature at which ticks will hatch. In my experience it takes thirty days of temperature ranging above 70 degrees for ticks to hatch; but when it ranges in the 90's they will hatch in twenty or twenty-one days. At 50 degrees they would not hatch at all."

Dr. Norgaard said:

"We have placed eggs in cold storage and they have hatched, but it took considerable time. The temperature never went over 40, and between the second and third months, if I remember right, the ticks had hatched, but the young ticks died shortly afterwards."

A motion to change the initial time from November 1st to 15th was lost.

The original motion to adopt was carried.

Dr. Connaway moved that the Committee on Resolutions be instructed to prepare and report a resolution regarding the compulsory disinfection of stock yards; and this was seconded and carried.

The Chair offered the following resolution, which was, upon motion, adopted:

RESOLUTION 2
(Establishing the Inter-State Association of Live Stock Sanitary Board)

WHEREAS, There are many questions of great interest to the officers and boards of the various states charged with the execution of the laws for the eradication and prevention of the spread of contagious and infectious diseases among domestic animals that could be discussed with much benefit to all and probably a greater uniformity of methods could be adopted in dealing therewith; and,

WHEREAS, Thorough organization is necessary to the successful accomplishment of any undertaking; and,
WHEREAS, The Bureau of Animal Industry in the United States Department of Agriculture should have the cooperation of the Live Stock Sanitary Boards of all the states and our united support in all of its investigations; therefore, be it

Resolved, That this organization is hereby declared permanent under the name of the “Inter-State Association of Live Stock Boards”, the membership to consist of the different state and territorial sanitary boards, state and territorial veterinarians, and five delegates to be named by the United States Secretary of Agriculture; and in states and territories where no live stock sanitary boards exist, of three members to be selected by the Board of Health, Board of Agriculture, or other bodies charged with the execution of the live stock sanitary laws, together with the Secretary of Agriculture and the Chief of the Bureau of Animal Industry who shall be honorary members.

Resolved, That before the adjournment this Association shall fix by vote the time and place for the next meeting of the Association, and that the Chairman and Secretary be instructed to notify the boards and proper officers of states and territories not here represented of the proposed meeting and invite them to attend and become members of the Association.

Resolved, That a committee of three be appointed to prepare a programme, consisting of papers to be read and questions to be considered, at the next meeting of the Association.

Resolved, That the officers of this Association shall be President, Vice-President and Secretary.

Upon motion, seconded and carried, the convention undertook the selection of place and time of the next meeting.

Mr. Lott, of Illinois, asked that the next annual meeting be held in Chicago, and pledged that the convention should be comfortably provided for, both in the way of a meeting place and hotel accommodations.

Mr. Riddle invited the convention to meet at Kansas City. Mr. Babcock desired the convention to meet at Omaha, and Mr. Skinner asked it to meet at Ft. Worth.

The advantages of each of those cities as a place of meeting were well presented, each advocate believing that his town was in some slight degree better than all the others.

Upon ballot by states, Ft. Worth received the largest number of votes, and was declared the place of the next meeting.

A motion to refer the matter of fixing the time of the next meeting to the executive committee, was ruled out of order because there was no executive committee.

It was suggested that the meeting be held on the first Tuesday of October, 1898, and a member absent-mindedly-asked what day of the week that would come on and was informed by the convention unanimously.

It was moved and seconded that the meeting be held the second Tuesday in March, 1898. An amendment to substitute the first Tuesday in November was rejected, and the original motion was carried.

Proceeding to the election of officers, Mr. C. P. Johnson of Illinois (the present Chairman), was unanimously elected President by acclamation. In the same manner Mr. R. J. Kleberg, of Texas, was elected Vice-President, and Mr. Taylor Riddle, of Kansas, Secretary.
Mr. Lott moved that the chair appoint a committee of three on Constitution and By-laws, and being seconded, the motion was carried.

On motion of Mr. Babcock, the present officers of the Association were constituted a committee of three to prepare a programme for the next meeting.

Dr. Gresswell suggested that this committee make provision for the consideration at the next meeting of the subject of tuberculosis, particularly with a view to recommending practical legislation with reference to the best and most practical methods of dealing with the disease in the several states north, which are troubled with this disease.

The President stated, as a member of the committee, that that subject would receive very careful consideration in the preparation of the programme.

The meeting adjourned until 2:30 p.m.

Upon the opening of the afternoon session, the Chair announced the appointment of the following gentlemen to constitute the Committee on Constitution and By-laws: Messrs. J. P. Lott, of Illinois; W. N. Babcock, of Nebraska, and W. B. Tullis, of Texas.

An additional resolution reported by the Committee on Resolutions was, on motion, adopted, as follows:

RESOLUTION 3
(On Disinfection of Cars)

Resolved, That this Convention of Sanitary Boards respectfully request the Secretary of Agriculture to compel a special and thorough disinfection of all cars and pens used in hauling, loading or unloading southern cattle, or cattle coming from sections south or east of the quarantine line as fixed by the Department of Agriculture; said disinfection to be done immediately after said quarantine line is raised and before such cars or pens are used for the handling of any cattle destined for points north of said line.

Mr. Riddle moved that a committee be appointed to examine the cattle that have been dipped since the opening of this convention; that such committee consist of Messrs. J. F. Williams, of Kansas, W. F. Cantelou, of Oklahoma, and Dr. Norgaard and Dr. Shannon of the Bureau of Animal Industry, Dr. Gresswell, of Colorado, Dr. Connaway, of Missouri, Dr. Lovejoy, of Illinois, and Mr. Tullis, of Texas; that this committee examine the cattle to-morrow, to ascertain the result of the second dipping, and report to the Secretary of the Association. The motion was carried.

The Secretary was instructed to forward to each member of this convention information of the results of this examination.

The Chair invited discussion with reference to the dipping tests that are being made, and the best methods to be adopted in further carrying on such tests and experiments.

Dr. Gresswell said that if all the ticks on the cattle dipped here yesterday were found dead to-morrow, he would be inclined to advise the Sanitary Board of Colorado to admit into that State a limited number of Texas tick infected cattle, dipped, to be mixed with native cattle, to ascertain whether or not the dipped cattle would impart fever to Colorado native cattle; that in any event Colorado would be safe
after October 1st. He inquired whether the Panhandle of Texas would be willing to make a little experiment; and Mr. Tullis replied that the Texans were depending on the United States Government and report; that whatever their representative recommended, Texas was willing to abide by; that Texas law binds its people to be governed by the action of the United States authorities.

Mr. Bort said that as far as Oklahoma was concerned, he did not think there would be any question but that such cattle would be admitted from south and east of the government line, because their Board had made an order admitting cattle under inspection after October 1st, anyway, for feeding purposes.

Mr. Riddle deprecated hasty and premature action; he would not be willing for such dipped cattle to be admitted into his State now, even if the committee appointed to-day should decide that the dipped cattle are entirely free from infection. The eyes of the Country are on these experiments that are taking place here, and if a steer did carry infection that fact would gain wide circulation, and a great many people, without investigating further, would say that the dipping was a failure, that the cattle were not free from infection, even though they were dipped twice and inspected. The Texas people are not asking that this matter be hurried up.

Mr. Skinner—"Not at all."

Mr. Riddle—"They want sufficient time, so that when it is declared successful, there will be no question. Kansas has no appropriation to draw on for the purpose of making these tests, but I think individuals could be induced to make the test and bear the expense."

Mr. Lott—"I think that would answer also for the State of Illinois. They would take the matter up through individuals."

Mr. Bort thought Oklahoma would be willing to cooperate in these tests, and would admit dipped cattle into that country, and he thought their agricultural college would make a test when they shall have reached the point that they are considered safe, and mix such dipped cattle with native cattle in portions of Oklahoma where there are no ticks; that he would bring the matter before his Board and report back to the Association.

Dr. Gresswell thought these test could be made by private enterprise without waiting for actions of states or departments. With this, Mr. Johnson, of Kansas, agreed; and Mr. Hill, of Missouri, said that his people were ready and willing to enter upon the tests suggested, provided that the inspection committee here reported favorably. Dr. Connaway thought a car load of dipped cattle would be sufficient for Missouri tests, if they represented the average dipping. Dr. Norgaard did not think there was any reason for commencing any wholesale experiments this fall; he thought it might be well for the experiment stations to enter upon the tests if they saw fit, and if they should make favorable reports, then it would be time to enter upon more extended experimentation. As it now is, there is a very short time, a few weeks only, and practically no time for a generation of young ticks to hatch and convey Texas fever when cattle are shipped from here up to any northern state. The experimental stations would be able to report to the convention meeting in the spring, and in the meanwhile we may have further perfected processes and had larger experiments, and then it would be time enough to take action on a large experiment.

Mr. Riddle said he was still of the opinion that the meeting in March, being so
early, could not accomplish any good, and moved that the motion by which the
meeting date was fixed for March, be reconsidered; this motion was seconded by
Mr. Lott, and carried. Dr. Connaway then moved as a substitute for the original
motion, that an Executive Committee of five, of which the three officers should
be ex-officio members, be elected, and that the question of the date for holding the
next meeting be referred to such committee for determination. This substitute
was lost.

An amendment to the original motion was then ordered, fixing the time of the
meeting the second Tuesday in October. This was seconded, and, after discussion,
was carried. The original motion, as amended, was then carried, fixing the date of
meeting the second Tuesday in October, 1898.

The Secretary stated that a sub-committee on resolutions had prepared a report
which had been submitted to the other members of the main committee. These
resolutions were then read by the Secretary, and, after verbal changes, they were,
on motion of Mr. Goddard, adopted, as follows:

RESOLUTION 4
(To Continue Dipping Experiments)

WHEREAS, The Live Stock Sanitary Boards of Colorado, Montana, Oklahoma,
Nebraska, Missouri, Illinois, Kansas and Texas are about to close a joint session
at Fort Worth, Texas, and,

WHEREAS, We have witnessed the dipping experiments for the eradication of the
tick, which we believe will thereby render the transmission of southern fever no
longer a matter of dread, and

WHEREAS, We recognize this work as a matter of the very greatest importance
to the agricultural interests of the entire United States, and to the South and West
in particular, as well as to the entire meat consumers of the world, and,

WHEREAS, We believe that the Department of Agriculture, fully alive to the
interests which it represents, should and will continue this work under the super-
vision of such efficient experts as have had control of the present experiments; therc-
fore, be it

Resolved, That we recognize in Dr. Victor A. Norgaard, the eminent animal pa-
thologist, a man well qualified to continue the supervision of the continuation of
the work to its practical results, and that we recommend that he, with his able
assistants, be retained for the supervision of this work; and be it further

Resolved, That, as far as we represent the cattle interests of the several states
from which we come, we convey to W. E. Skinner, General Manager of the Fort
Worth Stock Yards Company, the sincere gratitude of ourselves and our constitu-
ency for his labor and enterprise in endeavoring to carry to a successful issue, the
dipping experiments, which, at a great risk and expense, have been conducted at
this point, and we commend him and the company he represents, to the good graces
and the patronage of the cattle feeders and shippers not only of the State of Texas,
but of every state and territory having an interest or dealing in Texas cattle.

Mr. Kleberg moved that a vote of thanks be rendered to the Chairman and Sec-
retary for the impartial and efficient manner in which they have discharged their
duties, and to the press for the excellent reports made of the proceedings; and being
duly seconded, this motion was carried.
The convention then adjourned.

D. O. Lively,
Secretary of the Meeting.

To the Secretary of the Inter-State Association of Live Stock Sanitary Boards:

We, the undersigned, your duly appointed committee to investigate the experiments now being conducted at the Fort Worth Stock Yards, with the object of destroying the southern cattle tick, the carrier of southern or splenetic fever, by and under the supervision of officers of the Bureau of Animal Industry, submit the following as the result of our observations:

The tick carrying this fever from southern to susceptible northern cattle is extremely tenacious of life, and its thorough eradication by methods which will be economical and practical is extremely difficult. The long continued and exhaustive experiments hitherto made show in their results a great advance toward a successful issue, and the exhibition of the latest experiment leads us to the positive conclusion that ultimate practical success will be obtained. Without anticipating the report of the Bureau, we feel justified, however, in stating that the tick can be effectually killed by the material now being used, provided absolute and sure contact can be obtained, and we are of the opinion this fact has been demonstrated on animals which have been subjected to more than one dip; but we deem it advisable that the final test of exposure of dipped cattle to susceptible northern cattle be made upon northern pastures under official surveillance. The general disturbance created in cattle by the use of the tick-killing agent now in use, is of temporary character, and will not, in our opinion last longer than sixty hours, and animals submitted to this process will be ready for shipment after such time has elapsed from the time of dipping.

It is highly probable, however, that this disturbance will be lessened in character and duration by future improvements in the composition of the dip agent.

We find the facilities for carrying on this work are unequalled at the point at which they are now being conducted, and we bear testimony to the thoroughly scientific and able manner in which this difficult work is being prosecuted at the hands of the officials now in charge of it.

We recommend our respective sanitary boards to await the report of the Bureau of Animal Industry, but at the same time be prepared to make practical tests by admitting under due surveillance such animals as may be recommended to them by the government for such purposes.

Considering that the expert of the national government, having those experiments in charge, has not yet reported to the head of his department the final result of his work, we deem it inexpedient for us to express a more definite opinion of the results already obtained.

Respectfully submitted,

Colorado—Chas. Gresswell,
Texas—W. B. Tullis,
Kansas—J. F. Williams,
Missouri—J. W. Connaway,
Oklahoma—T. W. F. Cantelou,
CONCLUSIONS OF DR. J. W. CONNAWAY, M.D.C., M.D.

In view of the wide experience of Dr. J. W. Connaway in experimenting with dipped cattle to ascertain if they can communicate southern cattle fever to northern natives, at the experiment station, Columbia, Mo., as set forth in excerpts from Bulletin No. 37, published in this appendix,¹ the Board takes pleasures in producing herewith a letter received by the secretary from Dr. Connaway, under date of November 20, 1897, relative to the dipping experiments at Fort Worth, Tex., and experiments of the past week at the Missouri Stations:

Columbia, Mo., Nov. 20, 1897.

"Hon. C. P. Johnson, Secretary State Board Live Stock Commissioners, Springfield, Ill.:

"Dear Sir:—You ask my opinion of the dipping experiments at Fort Worth. The committee that was left to make further observations knew that their report, as it was given to the press, would not be satisfactory to the several state commissions that were represented, but it was left for each member of the special committee to report to his own board in greater detail. We deemed this the proper course to pursue, since our invitation to Fort Worth did not come from the authorities who had in charge the details of the dipping experiments."

* * * * *

"Now more specifically as to what we saw of the dipping, and its results. We remained long enough to determine that a single dipping with the agent used in the 'demonstration test' did not kill all the ticks either large or small; it seemed to be more effective on the small ticks than on the large ones.

"For some reason the second dipping was not made with the same mixture used in the first dip; the claim was made that the second mixture was milder than the first. The first dipping caused a slight stiffening in the legs of a few of the animals; doubtless to lessen this effect the milder mixture was substituted. We examined several of these cattle fifty hours or more after the second dipping and found live ticks, large and small, on every one examined. The number found after the second dipping was very small as compared with the first dipping. Many of the ticks that we saw alive after the second dipping doubtless succumbed later, but whether all of them did it is not for us to say, since we could not remain to note the final results. We examined in another pen several animals that were said to have been dipped fifteen days before, and some twenty days before. On the fifteen-day lot no ticks were found, but on the twenty-day lot two animals had ticks (Only four or five animals of each lot were examined). These ticks were apparently about two weeks old, from which one would conclude that the animals became reinfested from the ground six or seven days after the dipping. But that this was a reinfestation should be determined positively, since there is a possibility that these young ticks were on the animals at the time of the dipping, survived the ordeal and were inhibited in growth for a week or more. We are justified in presenting such a possibility from observations made on the growth of ticks in artificial infestation experiments. It has been noted in the work at this station that cool weather has a marked
inhibitory action on the growth of ticks already attached to the animal. In the fall they mature very slowly, whilst in midsummer the maturation is very rapid. It is not unreasonable to suppose that the dipping agent should exert a like influence on those ticks that have escaped its more deadly action. This, however, is a matter that can be determined definitely only by shipping the dipped cattle at once to territory where there is no possibility of a reinfestation.

"The conclusions I have come to from our joint work with the Texas Station, and confirmed by the visit to Fort Worth, are that three dippings with the mixtures used in last summer's work will be necessary to ensure perfect safety. The first dipping should be done at the ranch, the second a week later at some central point below the quarantine line, as Fort Worth, and the third at the terminal station.

"Dipping on the ranch should be encouraged for another purpose, that of ultimately exterminating the ticks from the southern soil. This first dipping need not be under the supervision of a sanitary officer, but it should be required that the animals show signs of having been dipped when they come into the yards where the second dipping is done. The second and third dippings should be under the supervision of the U. S. Bureau of Animal Industry, with such aid as any interested state may see fit to give. The third dipping should be done at the terminal station, in order to save delay when the cattle are at once started to market. A portion of the 'holdover' time that is necessary between the two dippings could thus be used in transit, and any further delay that may occur would be more profitable to the shipper at the selling station than at a way station; he would have a better command of the market. The third dipping should be done just before sending away from the terminal yards (Kansas City, St. Louis or Chicago). It is, of course, desirable that a dipping mixture be perfected that will kill all the ticks at one dipping, but I am doubtful as to this ever being accomplished, although I am confident that great improvements in the agents will be made. In a recent letter, Dr. Francis, of the Texas Experiment Station, says that he has a better 'dip' than the ones formerly used, and will ship us some dipped cattle in the spring, using the improved 'dip'."

**SOME FACTS REGARDING THE SECOND YEAR'S STATION EXPERIMENTS**

"I have neglected to say anything about our second year's experience (not yet published) on dipping. It is briefly this: Black oil without carbolic acid was used. Fourteen head were dipped, seven of these single dipped and seven double dipped. On arrival at this station a few ticks were found on both lots of cattle; many more on the single dipped than on the others. From these ticks in due time a reinfestation with the young ticks occurred, many hundreds appearing on the single dipped lot, while the reinfestation was very slight on the double dipped lot, only now and then could a tick be found. I am sure that a third dipping at this station would have made them perfectly safe, and if the time between the dippings had been longer, two dippings may have sufficed. In this experiment only four days elapsed between first and second dips. Moreover, the cattle were driven four miles over infected territory to the railroad station; here was a chance for picking up a few ticks after the dip."

1 Addendum to the Twelfth Annual Report of the State Board of Livestock Commissioners for the State of Illinois for the Fiscal Year Ending October 31, 1897.
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Russel S. Weeks  
William B. Wright

NEW HAMPSHIRE
Fred E. Allen  
Norman S. Brungot  
Andrew Christie  
Paul E. Fessenden  
Wilson R. Haubrich  
Richard L. Hill  
Carl L. Martin  
Eric W. Simmons  
Charles B. Wiggin, Jr.
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Kansas City, Mo.
November 14, 15, 16, 1951