PROCEEDINGS

Forty-Second Annual Meeting

of the

United States Live Stock Sanitary Association

HOTEL LA SALLE
CHICAGO
Nov. 30 and Dec. 1-2, 1938
PROCEEDINGS

Forty-Second Annual Meeting

of the

United States Live Stock Sanitary Association

HOTEL LA SALLE
CHICAGO
Nov. 30 and Dec. 1-2, 1938
# TABLE OF CONTENTS

## Wednesday Morning Session, November 30, 1938

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Effect of Weather—By Prof. Wm. F. Petersen</td>
<td>2</td>
</tr>
<tr>
<td>Address of the President</td>
<td>9</td>
</tr>
<tr>
<td>Memorial Service</td>
<td>12</td>
</tr>
<tr>
<td>Report of the Secretary-Treasurer</td>
<td>14</td>
</tr>
<tr>
<td>Appointment of Auditing Committee</td>
<td>14</td>
</tr>
</tbody>
</table>

## Wednesday Afternoon Session, November 30, 1938

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomplishments in the Federal-State Bang's Disease Project—By Dr. A. E. Wight</td>
<td>16</td>
</tr>
<tr>
<td>Some Pertinent Remarks on Abortion Disease Control—By Prof. L. F. Rettger</td>
<td>22</td>
</tr>
<tr>
<td>Discussion</td>
<td>29</td>
</tr>
<tr>
<td>The Control of Brucella Agglutination Antigen by Means of Dried Serum—By Messrs. Robert M. Chapin, Jacob M. Schaffer, and Percy W. LeDuc</td>
<td>31</td>
</tr>
<tr>
<td>The Range Cattleman's View in Bang's Disease Control—By Mr. J. Elmer Brock</td>
<td>39</td>
</tr>
<tr>
<td>Discussion</td>
<td>48</td>
</tr>
<tr>
<td>Area Work in Bang's Disease Control in Arkansas—By Dr. C. D. Stubbs</td>
<td>52</td>
</tr>
<tr>
<td>Discussion</td>
<td>54</td>
</tr>
<tr>
<td>Report of the Committee on Bang's Disease—Dr. C. P. Fitch, Chairman</td>
<td>57</td>
</tr>
<tr>
<td>Report of the Special Committee on Public Relations—Dr. J. Leonard Axby, Chairman</td>
<td>54</td>
</tr>
<tr>
<td>Report of the Committee on Rabies—Dr. H. C. Rinehart, Chairman</td>
<td>61</td>
</tr>
<tr>
<td>Report of the Committee on Revision of Constitution and By-Laws—Dr. Mark Welsh, Chairman</td>
<td>63</td>
</tr>
<tr>
<td>Appointment of Nominating Committee</td>
<td>63</td>
</tr>
<tr>
<td>Report of the Committee on Tick Eradication—Dr. T. O. Booth, Chairman</td>
<td>63</td>
</tr>
</tbody>
</table>

## Thursday Morning Session, December 1, 1938

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Importance of Sanitation and Care in the Control of Swine Diseases—By Dr. J. H. Rietz</td>
<td>66</td>
</tr>
<tr>
<td>Discussion by Dr. K. W. Stouder</td>
<td>75</td>
</tr>
<tr>
<td>Community Sales as a Factor in the Spread of Swine Diseases—By Dr. F. A. Zimmer</td>
<td>81</td>
</tr>
<tr>
<td>Brucella Infection of Swine—By Dr. S. H. McNutt</td>
<td>90</td>
</tr>
<tr>
<td>Discussion By Dr. W. H. Feldman</td>
<td>98</td>
</tr>
<tr>
<td>Report of the Committee on Transmissible Diseases of Swine—Dr. C. N. McBryde, Chairman</td>
<td>99</td>
</tr>
<tr>
<td>The Desirability of Uniform State Sanitary Regulations Affecting Interstate Shipment of Live Stock—By Mr. John B. Gage</td>
<td>101</td>
</tr>
<tr>
<td>Discussion by Mr. L. M. Pexton</td>
<td>110</td>
</tr>
<tr>
<td>Report of the Special Committee on Uniform Interstate Certificate Blanks—Dr. William Moore, Chairman</td>
<td>113</td>
</tr>
</tbody>
</table>

**Thursday Afternoon Session, December 1, 1938**

| Some Phases of Meat Inspection—By Dr. J. S. Koen | 116 |
| A Microscopic Test for Quality Milk—By Dr. C. S. Bryan | 122 |
| Discussion | 132 |
| Remarks—By Dr. George Gillie | 134 |
| Meat and Milk Inspection in St. Louis—By Dr. J. F. Bredeck | 134 |
| Discussion | 143 |
| Report of the Committee on Meat and Milk Hygiene—Dr. A. F. Schalk, Chairman | 144 |
| A Review of the 1938 Outbreak of Equine Encephalomyelitis in the United States—By Dr. M. S. Shahan, Dr. L. T. Giltner and Dr. H. W. Schoening | 145 |
| Massachusetts Experiences an Invasion of Equine Encephalomyelitis, Eastern Type—By Hon. Charles F. Riordan | 157 |
| Report of the Committee on Miscellaneous Transmissible Diseases—Dr. F. A. Zimmer, Chairman | 161 |

**Friday Morning Session, December 2, 1938**

| Progress in Polloram Disease Control and Eradication—By Dr. Henry Van Roekel | 162 |
| Wheat Germ Oil in the Control of Fowl Paralysis—By Dr. Erwin Jungherr | 171 |
| Investigation of Pox in Canaries—By Dr. A. J. Durant | 181 |
| Method and Practical Application of Egg Propagated Avian Viruses—By Dr. G. L. Dunlap | 188 |
| Report of the Committee on Transmissible Diseases of Poultry—Dr. George E. Corwin, Chairman | 193 |
| Newer Knowledge of Poultry Parasites—By Dr. J. E. Ackert | 197 |
| Report of the Committee on Parasitic Diseases—By Dr. Benjamin Schwartz | 209 |

**Friday Afternoon Session, December 2, 1938**

<p>| Tuberculosis in Poultry and Swine—By Dr. J. A. Barger | 215 |
| Discussion by Mr. John M. Stout | 219 |
| The Progress and Status of Cooperative Tuberculosis Eradication Work—By Dr. A. E. Wight | 221 |</p>
<table>
<thead>
<tr>
<th>Report</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis Eradication in the State of California—</td>
<td>227</td>
</tr>
<tr>
<td>By Dr. C. U. Duckworth</td>
<td></td>
</tr>
<tr>
<td>Progress of Tuberculosis Eradication in Canada—</td>
<td>231</td>
</tr>
<tr>
<td>By Dr. Orlan Hall</td>
<td></td>
</tr>
<tr>
<td>Report of the Committee on Tuberculosis—</td>
<td>236</td>
</tr>
<tr>
<td>Dr. R. W. Smith, Chairman</td>
<td></td>
</tr>
<tr>
<td>Report of the Special Committee on Poultry and Rabbit-Meat Inspection—</td>
<td>237</td>
</tr>
<tr>
<td>Dr. L. M. Hurt, Chairman</td>
<td></td>
</tr>
<tr>
<td>Report of the Committee on Policy—</td>
<td>239</td>
</tr>
<tr>
<td>(Read by Dr. John R. Mohler)</td>
<td></td>
</tr>
<tr>
<td>Report of the Committee on Legislation—</td>
<td>240</td>
</tr>
<tr>
<td>Dr. Charles E. Cotton, Chairman</td>
<td></td>
</tr>
<tr>
<td>Report of the Committee on Resolutions—</td>
<td>242</td>
</tr>
<tr>
<td>Dr. Jacob, Chairman</td>
<td></td>
</tr>
<tr>
<td>(Read by Dr. Leonard Axby)</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>243</td>
</tr>
<tr>
<td>Motion to Approve Report of Resolutions Committee</td>
<td>244</td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Tick Eradication</td>
<td>244</td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Revision of Constitution and</td>
<td>244</td>
</tr>
<tr>
<td>By-Laws</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Tuberculosis</td>
<td>244</td>
</tr>
<tr>
<td>Motion to Approve Report of Special Committee on Inspection of Poultry</td>
<td>244</td>
</tr>
<tr>
<td>and Rabbit Meat</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Transmissible Diseases of Poultry</td>
<td>244</td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Meat and Milk Hygiene</td>
<td>240</td>
</tr>
<tr>
<td>Motion to Approve Report of Special Committee on Unification of</td>
<td>245</td>
</tr>
<tr>
<td>Interstate Certificate Blanks</td>
<td></td>
</tr>
<tr>
<td>Report of Committee on Uniform Laws and Regulations—</td>
<td>245</td>
</tr>
<tr>
<td>Dr. H. D. Port, Chairman</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Unification of Laws and</td>
<td>247</td>
</tr>
<tr>
<td>Regulations</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Transmissible Diseases of</td>
<td>247</td>
</tr>
<tr>
<td>Swine</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Rabies</td>
<td>247</td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Public Relations</td>
<td>247</td>
</tr>
<tr>
<td>Motion to Approve Report of Committee on Bang’s Disease</td>
<td>247</td>
</tr>
<tr>
<td>Report of the Auditing Committee—</td>
<td>247</td>
</tr>
<tr>
<td>Dr. Charles E. Cotton, Chairman</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Auditing Committee</td>
<td>247</td>
</tr>
<tr>
<td>Report of the Nominating Committee—</td>
<td>248</td>
</tr>
<tr>
<td>Dr. E. T. Faulder, Chairman</td>
<td></td>
</tr>
<tr>
<td>Motion to Approve Report of Nominating Committee</td>
<td>249</td>
</tr>
<tr>
<td>Election of Officers</td>
<td>249</td>
</tr>
<tr>
<td>Installation of Officers</td>
<td>249</td>
</tr>
<tr>
<td>Adjournment</td>
<td>251</td>
</tr>
</tbody>
</table>
OFFICERS AND COMMITTEES, 1938 - 1939

PRESIDENT
Dr. J. L. Axby
Indianapolis, Indiana

VICE-PRESIDENTS
Dr. H. D. Port, 1st Vice-President, Cheyenne, Wyo.
Dr. I. S. McAdory, 2nd Vice-President, Auburn, Ala.
Dr. F. A. Zimmer, 3rd Vice-President, Columbus, Ohio

SECRETARY-TREASURER
Dr. L. Enos Day
3933 Drexel Boulevard
Chicago, Ill.

COMMITTEE ON PROGRAM
Dr. L. Enos Day, Chairman, Chicago, Ill.
Dr. J. L. Axby, Indianapolis, Ind. Dr. H. D. Port, Cheyenne, Wyo.

COMMITTEE ON LEGISLATION
Dr. H. E. Curry, Chairman, Jefferson City, Mo.
Dr. Chas. E. Cotton, St. Paul, Minn. Dr. E. T. Faulder, Albany, N. Y.
Mr. Will J. Miller, Topeka, Kans. Mr. John P. Stout, Springfield, Ill.

COMMITTEE ON RESOLUTIONS
Dr. D. M. Campbell, Chairman, Chicago, Ill.
Dr. L. A. Merillat, Chicago, Ill. Dr. H. Busman, Indianapolis, Ind.

COMMITTEE ON POLICY
Dr. W. J. Butler, Chairman, Helena, Mont.
Dr. R. W. Smith, Concord, N. H. Mr. H. R. Smith, Chicago, Ill.
Dr. John R. Mohler, Washington, Dr. D. E. Westmorland, Frankfort, D. C.
Ky.
VI  PROCEEDINGS OF THE

COMMITTEE ON REVISION OF CONSTITUTION AND BY-LAWS
Dr. Marvin R. Hales, Chairman, Olympia, Wash.
Dr. J. V. Knapp, Tallahassee, Fla. Dr. E. A. Crossman, Boston, Mass.

COMMITTEE ON UNIFICATION OF LAWS AND REGULATIONS
Dr. W. H. Hendricks, Chairman, Salt Lake City, Utah
Dr. C. T. Guilfoyle, Phoenix, Ariz. Dr. W. H. Lytle, Salem, Ore.
Mr. Herbert M. Tucker, Augusta, Me. Dr. R. M. Gow, Denver, Colo.

COMMITTEE ON BANG'S DISEASE
Dr. C. P. Fitch, Chairman, St. Paul, Minn.
Dr. A. E. Wight, Washington, D.C. Dr. H. C. Givens, Richmond, Va.
Dr. C. D. Stubbs, Little Rock, Ark. Dr. V. S. Larson, Madison, Wis.
Dr. R. M. Sard, Dover, Del.

COMMITTEE ON TUBERCULOSIS
Dr. C. U. Duckworth, Chairman, Sacramento, Calif.
Dr. A. E. Wight, Washington, D.C. Dr. A. E. Cameron, Ottawa, Ont.,
Dr. E. T. Faulder, Albany, N.Y. Canada
Dr. D. H. Ricks, Oklahoma City, Ok. Dr. H. A. Seidell, Des Moines, Iowa

COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE
Dr. C. N. McBryde, Chairman, Ames, Iowa
Dr. T. W. Munce, Sioux City, Iowa Dr. H. C. H. Kernkamp, St. Paul,
Dr. V. F. Saylor, Zionsville, Ind. Minn.
Dr. H. M. O'Rear, Washington, D.C.

COMMITTEE ON PARASITIC DISEASES
Dr. Benjamin Schwartz, Chairman, Washington, D.C.
Dr. J. E. Ackert, Manhattan, Kans. Dr. H. D. Port, Cheyenne, Wyo.
Dr. B. T. Simms, Auburn, Ala. Dr. E. A. Watson, Hull, Que., Can.

COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES
Dr. Edward Records, Chairman, Reno, Nev.
Dr. Mark Welsh, College Park, Md. Dr. A. C. Topmiller, Nashville,
Dr. T. O. Brandenburg, Bismarck, Tenn.
N. Dak.

COMMITTEE ON MEAT AND MILK HYGIENE
Dr. A. F. Schalk, Chairman, Columbus, Ohio
Dr. J. S. Koen, Storm Lake, Iowa Dr. C. H. Clark, Lansing, Mich.
Dr. H. B. Leonard, Albany, N.Y. Hon. J. B. McLaughlin, Charleston,
W. Va.
COMMITTEE ON TICK ERADICATION
Dr. T. O. Booth, Chairman, Fort Worth, Texas
Dr. E. P. Flower, Baton Rouge, La. Dr. I. S. McAdory, Auburn, Ala.
Dr. William Moore, Raleigh, N. C. Dr. J. M. Sutton, Atlanta, Ga.

COMMITTEE ON BABIES
Dr. H. W. Schoening, Chairman, Washington, D. C.
Dr. H. C. Rinehart, Springfield, Ill. Dr. M. F. Barnes, Harrisburg, Pa.
Dr. Edwin T. Powell, Boise, Idaho Dr. Fred Breed, Lincoln, Neb.

COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY
Dr. Irwin Jungherr, Chairman, Storrs, Conn.
Dr. Henry Van Rockel, Amherst, Mass.
Dr. A. J. Durant, Columbia, Mo.
Dr. R. S. Robinson, Pierre, S. Dak.
Dr. L. P. Doyle, Lafayette, Ind.
Dr. J. S. Anderson, Lincoln, Neb.

SPECIAL COMMITTEE ON POULTRY AND RABBIT MEAT INSPECTION
Dr. L. M. Hurt, Chairman, Los Angeles, Calif.
Dr. R. S. Going, Montpelier, Vt.
Dr. J. S. Healy, Madison, Wis.
Dr. F. L. Schneider, Albuquerque, N. Mex.
Dr. E. S. Brashier, Jackson, Miss.

SPECIAL COMMITTEE ON ADVISABILITY OF ISSUING LIVESTOCK REGULATORY REPORTS BI-ANNUALLY
Dr. M. Jacob, Chairman, Knoxville, Tenn.
Dr. D. M. Campbell, Chicago, Ill. Dr. H. A. Seidell, Des Moines, Ia.

COMMITTEE TO SUMMARIZE LAWS AND REGULATIONS GOVERNING INTERSTATE MOVEMENT OF LIVESTOCK AND DRAFT UNIFORM LAWS AND REGULATIONS SO FAR AS POSSIBLE, INCLUDING B.A.I. REGULATIONS PERTAINING TO INTERSTATE SHIPMENT OF LIVESTOCK
Dr. W. H. Lytle, Chairman, Salem, Ore.
Dr. A. W. Miller, Washington, D. C. Dr. H. E. Curry, Jefferson City, Mo.
Dr. H. C. Rinehart, Springfield, Ill. Dr. R. W. Smith, Concord, N. H.
Records of the early meetings of the Interstate Association of Live Stock Sanitary Boards are very meager. The first meeting of the organization was held in Fort Worth, Texas, September 28-29, 1897, primarily to inspect a vat for dipping cattle and sheep that had been constructed in that city.

The name of the organization was changed at the 13th annual meeting held in Chicago, Ill., in 1909, to the United States Live Stock Sanitary Association. All meetings since 1909 have been held in Chicago.

Meetings | Date | Place | President | Secretary
---|---|---|---|---
1 | Sept. 28-29, 1897 | Fort Worth, Tex. | * | *
2 | 1898 | * | * | *
3 | 1899 | Chicago, Ill. | * | *
4 | 1900 | Louisville, Ky. | * | *
5 | Oct. 8-9, 1901 | Buffalo, N. Y. | E. P. Niles | F. T. Eisenman
7 | Sept. 22, 1903 | Denver, Colo. | W. E. Bolton | Hon. W. P. Smith
8 | Aug. 23-25, 1904 | St. Louis, Mo. | J. C. Norton | Hon. W. P. Smith
9 | 1905 | Guthrie, Okla. | Hon. W. P. Smith | S. H. Ward
11 | Sept. 16-17, 1907 | Richmond, Va. | D. F. Lucky | G. A. Jarman
14 | Dec. 5-7, 1910 | Chicago, Ill. | Chas. E. Cotton | J. J. Ferguson
15 | Dec. 6-8, 1911 | Chicago, Ill. | John F. DeVine | J. J. Ferguson
16 | Dec. 5-6, 1912 | Chicago, Ill. | Mazyck P. Ravenel | J. J. Ferguson
17 | Dec. 2-4, 1913 | Chicago, Ill. | Peter F. Bahnsen | J. J. Ferguson
18 | Feb. 16-18, 1914 | Chicago, Ill. | S. H. Ward | J. J. Ferguson
20 | Dec. 5-7, 1916 | Chicago, Ill. | O. E. Dyson | J. J. Ferguson
21 | Dec. 2-4, 1917 | Chicago, Ill. | J. G. Wills | S. H. Ward
22 | Dec. 2-4, 1918 | Chicago, Ill. | M. Jacob | S. H. Ward
23 | Dec. 1-2, 1919 | Chicago, Ill. | G. W. Dumpy | D. M. Campbell
24 | Nov. 29-30- Dec. 1, 1920 | Chicago, Ill. | S. F. Musselman | D. M. Campbell
25 | Nov. 28-30, 1921 | Chicago, Ill. | W. F. Crewe | Theo. A. Burnett
26 | Dec. 6-8, 1922 | Chicago, Ill. | T. E. Munce | Theo. A. Burnett
27 | Dec. 5-7, 1923 | Chicago, Ill. | W. J. Butler | O. E. Dyson
28 | Dec. 3-5, 1924 | Chicago, Ill. | J. G. Ferneyhough | O. E. Dyson
31 | Nov. 30- Dec. 1-2, 1927 | Chicago, Ill. | L. Van Es | O. E. Dyson
32 | Dec. 2-5, 1928 | Chicago, Ill. | C. A. Cary | O. E. Dyson
33 | Dec. 4-6, 1929 | Chicago, Ill. | Chas. G. Lamb | O. E. Dyson
34 | Dec. 3-5, 1930 | Chicago, Ill. | A. E. Wight | O. E. Dyson
35 | Dec. 2-4, 1931 | Chicago, Ill. | J. W. Connaway | O. E. Dyson
36 | Nov. 30- Dec. 1-2, 1932 | Chicago, Ill. | Peter Malcolm | O. E. Dyson
37 | Dec. 6-8, 1933 | Chicago, Ill. | E. T. Faulder | O. E. Dyson
38 | Dec. 5-7, 1934 | Chicago, Ill. | T. E. Robinson | O. E. Dyson
39 | Dec. 4-6, 1935 | Chicago, Ill. | Edward Records | O. E. Dyson
40 | Dec. 2-4, 1936 | Chicago, Ill. | Walter Wisnicky | L. Enos Day
42 | Nov. 30- Dec. 1-2, 1938 | Chicago, Ill. | D. E. Westmorland | L. Enos Day

*Information not available. †Deceased. ‡Dr. Musselman died October 27, 1920. In the absence of the first and second vice-presidents, Dr. E. M. Rank and F. A. Halser, the third vice-president, Dr. W. F. Crewe presided at the 1920 meeting.

This information was supplied in the main by Dr. D. M. Campbell and D. F. Lucky.
Report of the Proceedings

of the

Forty-Second Annual Meeting

of the

United States Live Stock Sanitary Association

Chicago, Ill., November 30 and December 1-2, 1938

WEDNESDAY MORNING, NOVEMBER 30, 1938

The opening session of the forty-second annual meeting of the United States Live Stock Sanitary Association, held on November 30, December 1 and 2, 1938, at the Hotel La Salle, Chicago, Ill., convened at 10:15 o'clock, Dr. D. E. Westmorland, President of the Association, presiding.

PRESIDENT WESTMORLAND: Gentlemen, will you please come to order.

This meeting is for the purpose of transacting what business might came before the Forty-Second Annual Meeting of the United States Live Stock Sanitary Association. To proceed in an orderly manner, the Chair will entertain a motion that we proceed with the program instead of following the program outlined by our Constitution and By-Laws.

DR. J. LEONARD AXBY (Indiana); Mr. President, I move that the regular order of business be dispensed with, and that the printed program be used in lieu thereof.

DR. E. T. FAULDER (New York): I second the motion.

... The motion was voted upon and carried unanimously. ...

PRESIDENT WESTMORLAND: It has been the custom for the past several years, in this organization, to select for our opening address an outstanding scientist who has conducted special investigation upon the particular subject to be discussed. We have with us this morning Professor William F. Petersen, of the Department of Pathology, College of Medicine, University of Illinois. Dr. Petersen will discuss a subject which, I am sure, will be of interest to all of us, entitled, "Biological Effect of Weather."

I now take pleasure in introducing Professor Petersen. (Applause.)
BIOLOGICAL EFFECT OF WEATHER

By Prof. William F. Petersen, Chicago, Ill.

Department of Pathology, College of Medicine,
University of Illinois

Mr. President, Ladies and Gentlemen:

When in the 13th century, the scholarly Emperor Frederick II presented a collection of Greek scientific works to the University of Paris, he did so with the notation that “it was good to drink clear water from old wells.” I propose to do the same sort of thing, to go back to the same sources, that now date back some 2,500 years. I do this because I am going to talk about the particular subjects which Hippocrates discussed but I propose to give you a modern scientific analysis of his original investigations.

I may say that Hippocrates was not only the first Greek physician whom we can definitely identify, but he was also the world’s first scientific biologist. He was the world’s first meteorologist. I presume he was the first scientist ever to definitely describe animal disease in terms that would be familiar to us. He did that in his work on “The Sacred Disease,” i.e., epilepsy. During the day in which Hippocrates lived most people still had the notion that the Gods were responsible for disease, and his primary purpose in writing the book on epilepsy was to point out that epilepsy was due to purely natural causes. He strengthened his argument by the discussion of a similar phenomenon in cattle: “The nature of this is best shown by the cattle that are attacked by this disease, especially by goats which are the most common victims. If you cut open the head you will find the brain moist, very full of dropsy and of an evil odor whereby you may learn that this is not a God but a disease which injures the body. So it is also with a man.” (Paragraph 14.)

In his great book on “Airs, Water, Places,” Hippocrates points out that before we study biology and medicine, we should learn something of the meteorological environment. Says he:

“Whoever wishes to pursue properly the science of medicine must proceed thus: First, he ought to consider what effects each season of the year can produce; for the seasons are not at all alike, but differ widely both in themselves and at their changes. The next point is the hot winds and the cold, especially those that are universal, but also those that are peculiar to each particular region. For knowing the changes of the seasons, and the risings and setting of the
stars, he will have full knowledge of each particular case, will succeed best in securing health, and will achieve the greatest triumphs in the practice of his art. If it be thought that all this belongs to meteorology, he will find out, on second thought, that the contribution of astronomy to medicine is not a very small one but a very great one indeed. For with the seasons, men's diseases, like their digestive organs, suffer change."

Another statement concerns the probability that the embryo is particularly susceptible to environmental effects early in development. "The other people of Europe differ from one another both in stature and in shape because of the changes of the seasons, which are violent and frequent, while there are severe heat waves, severe winters, copious rains, and then long droughts, and winds, causing many changes of various kinds. Wherefore it is natural to realize that generation too varies in the coagulation of the seed,* and is not the same for the same seed in summer as in winter, nor in rain as in drought. It is for this reason that the physique of Europeans varies more than that of the Asiatics, and that their stature differs very widely in each city. For there arise more corruptions in the coagulation of the seed when the changes of the seasons are frequent than when they are similar or alike."

Hippocrates knew a great deal about circulation of the blood and actually goes right down to fundamentals in the book on "Breaths" where he postulates that all of our difficulties arise because of difference in the possibilities of oxidation. Specifically he says: "In one place the circulation in the blood stops; in another place it passes sluggishly; in another more quickly. The progress of the blood through the body proving irregular, all kinds of irregularities occur."

**VASCULAR AND OXIDATIVE VARIABILITY**

It shall be my purpose to demonstrate the correctness of some of these Hippocratic fundamentals, first the association of environmental instability with vasomotor variability.

The blood supply to the different tissues of the body constantly varies with every function and since the functional demand is constantly changing, the vascularization is constantly adjusting to this demand. When for any reason the functional demand of an organ becomes too great, the blood supply may become inadequate and then an organ dysfunction may become apparent. If now we deal with an organ that already has an impaired function, then even a moderate increase in demand on the organ may result in oxidative inadequacy.

---

*Early development of the embryo.*
When we follow blood pressure day by day in the human or in the animal it becomes evident that a continuous rhythm can be made out, a rhythm that is modified by many factors, but the chief factor is the condition of the atmosphere in which the organism is existing. If we live in the region of the northern storm tracks, we might have clear, heavy (dry polar air) passing over us at one time and this will alternate with tropical air when the barometric pressure is lower, the temperature higher, and there is a greater moisture content in the air mass.

With polar air the blood pressure tends to be higher. This can be readily demonstrated (slides) both for the normal as well as the sick individual; in the sick individual such fluctuations in vascularization will find reflection in changing clinical symptomatology, with changes in the temperature, in the pulse rate, in the basal metabolic rate, in the leucocyte count, etc. (Slides.)

It is very likely that the human being is particularly susceptible to atmospheric change and this largely because we have no hairy coat to mediate the effect; we make up partly for the deficiency by clothing.

It is very probable that an unusual sensitivity of the human skin has been associated with the development of a greater sensitivity of the autonomic control of the blood mass (because the blood must constantly be shunted from the periphery to the interior and vice versa) as the air temperature changes. It is probable that this led in time to a rapid increase in pace of progressive evolution for the human. In the first place we know that man differentiated in a relatively unfavorable central Asiatic land mass and differentiated more rapidly with the periods of glaciation; with such periods of stress and strain the chances for the development of new forms would be greater and a more rigid selection of survivors would occur. This has been true not only for man but for the domestic animals as well.

Rapid changes in regional vascular variability would be of significance in this connection because of the close integration of the autonomic connections of the skin to the central nervous system on the one hand and to the pelvic organs on the other. Greater variability in the central nervous system might presumably be followed by greater stimulation of the central nervous system; greater variability of the vasculization of the reproductive organs might presumably result in greater modification of the offspring, especially in the earliest stages of development.
How can we demonstrate this possibility, namely, that with greater environmental variability we will modify the race?

We can first of all demonstrate that the winter and late spring offers greater life hazards, particularly for the young and for the old age groups. Peak mortality usually occurs in March and April in the northern regions (slides). The summer and autumn is a period of recuperation, i.e., a period of anabolism, storage, preparation for the winter. With this there is a distinct increase in organic resistance (slides). Conversely, with the periods of greatest environmental variability and strain (January, February, March) there are fewer conceptions.

Biochemically we can clearly demonstrate the crest of the environmental demand in the late winter and spring by merely following the blood chemistry from day to day and note the increasing acidity, the increasing capillary permeability, the lowering of the K/Ca ratio, lowering of vascular tone, etc., all of which usually reach a crest at the end of March or sometime in April.

With the late spring and summer all these trends are reversed, the pH increases, capillary permeability is lessened, the K/Ca ratio increases.

These are, of course, seasonal tides. Individual weather changes have the same general effects. Cold, associated with a transient alkalosis, is followed by a definite trend toward acidosis. Heat, especially if associated with humidity, is followed by a relative alkalosis, the result of a whole series of functional changes; sweating, increased pulmonary ventilation, change in the summer diet, the lessening of work, endocrine alterations, etc. Naturally the effectiveness of the alteration will vary with the sex (menstrual cycle), with age, with the degree of exposure or shelter, and very definitely with the body build.

BODY BUILD

In general terms there are two extremes in human body build. We deal with the broad individual who has a well padded skin, is stocky, heavy boned, preponderatingly anabolic, plethoric, with a wide vascular bed, well oxygenated tissues. This kind of individual can “take it;” in general the female trends in this metabolic direction, because it is potentially useful in stabilization of the organism and therefore protective for the development of the embryo.

By contrast to this there is the slender type, the leptosome, usually thin skinned, much more graceful, catabolic, with a
small and contracted vascular bed, and in general, poorly oxygenated. When living in the belt of meteorological turbulence this kind of individual is apt to suffer from fatigue because of the greater metabolic strain (since he has less buffer, less fat padding, etc.).

This type is the more differentiated and gets into autonomic difficulties early in life (migraine, gastric ulcer, multiple sclerosis, schizophrenia, tuberculosis) but if he passes through early adult life this kind of person usually lives longer than the broad type because the constant vascular massage, entailed by the necessarily acute and rapid adjustment to the environment, keeps the blood vessels reactive and the tissues relatively young.

Roughly we can speak of the "armadillo" and the "chameleon" types, or if you wish to think in human terms, Douglas and Lincoln will portray the two trends.

It would appear that the underlying metabolic trends upon which these types are based, the one more anabolic, the other catabolic, need not only be hereditary but the hereditary trends can be conditioned by the environment of the mother at the time of development of the egg.

In other words, the conception occurring when the maternal organism is stimulated, catabolic, relatively acid, etc., may tend to retain this type of metabolism through adult life and, conversely, an organism that took origin when the metabolism of the mother was relatively quiescent, anabolic, retentive, and alkaline, will more probably become relatively broad in stature in adult life. Study of the weight/length ratio of college students (slides) would appear to bear out this thesis because their habitus changes definitely with the season of conception. All this merely adds validity to the Hippocratic observations.

Similarly it is demonstrable that during the period of the year when the atmospheric turbulence is greater, we note the conception of more individuals of divergent mental quality. So, for instance, people of genius, or who may become insane, or who are a social, are more apt to have been conceived during such a time, the while the more normal individual, i.e., the individual of average mentality is apparently more often conceived during the more stable months of the year (slides).

It seems very probable that the metabolic gradients of the mother at the time of conception may also condition the sex of the offspring. A study of the day by day sex ratio of the new born in Chicago lends much support to this assumption.
but our statistical studies have not yet progressed to the stage where I can make this as a statement of fact. As you know, similar observations have been made by stock breeders.

When we now turn to a study of the weather and disease susceptibility it can readily be demonstrated that such an influence is clearly discernible. I shall merely present the Chicago figures for scarlet fever (slides). We have made day by day studies for the onset of scarlet fever for the years 1934 and 1935 and both a graphic survey of the charts and the statistical analysis permit us to state that 24 hours after the passage of a cold air mass over the city the number of cases of scarlet fever increase materially, provided the proper organisms are on the surface of the mucous membranes of the population and a sufficient number of individuals are susceptible to the toxin.

Finally I would call your attention to the fact that the observations which have here been demonstrated for man have been definitely recorded for domestic animals (cattle, sheep, etc.), by Duerst, director of the veterinarian faculty of the University of Bern.

Duerst's observations cover a period of over 30 years during which time he has followed a consistent pathway, namely, the study of differences of oxygen availability of domestic animals domiciled in different regions of the world.

In general terms this has led to the following conclusions:

(1) That seemingly minor differences in oxygen availability are of immense significance for all races of domestic animals. These differences, though seemingly small, are associated with differences in the altitude, with differences in the environmental temperature. They are, in addition, conditioned by the food intake and, of course, by the type of animal, (whether cattle, for instance, are either milk producers or are characteristically beef cattle). With a given breed, two variants tend to develop, namely, animals that are of the respiratory or of the digestive types. In other words, animals that are potentially oxygen hungry and animals that are potentially oxygen satisfied. The former become slender, long, the bones are finer, the metabolism is relatively acid; the digestive types are broader, shorter, the bones are coarser, the animals are relatively alkaline.

Even minor degrees of oxygen deficiency find their reflection most often in obvious changes in the thyroid gland, with hypertrophy as a characteristic expression. In the presence of large quantities of iodine, or large quantities of available oxygen, with lessened demand, there may be a distinct
atrophy of the thyroid gland demonstrable in certain breeds of cattle.

Duerst has followed the change in the oxidative demand and adequacy not only in the characteristic fat content of the milk but in the condition of the hair and of the skin in general.

In this latter connection he has associated changes in the pigmentation with oxygen adequacy or inadequacy and assumes that depth of pigmentation is fundamentally conditioned by the degree of oxygen availability. Animals that are relatively acid and air hungry are apt to have lighter pigmentation than animals that are relatively alkaline and oxygen satiated.

The constitutional type of the animal can be conditioned by changing the metabolic status of the maternal organism. This has been accomplished by shifting from calcium to potassium preponderance or from alkaline to acid preponderance in the diet. These observations of Duerst are similar to those made by Katase and his pupils.

Finally Duerst and his pupils observe that it is possible to change the sex ratio of animals by a variety of procedures fundamentally based on oxygen adequacy or inadequacy.

Thus observations made on domestic animals would appear to be quite similar in their general nature to those that we have followed in the human and which in turn but confirm the observations of the oldest Greek physicians.

Thank you. (Applause.)


Katase, A.—Der Einfluss der Ernahrung auf die Konstitution des Organismus, Berlin, Urban, 1931.


Volume III, Mental and Nervous Disease, Edwards Brothers, Ann Arbor, Michigan, 1934.


DR. ALBERT T. KINSLEY (Kansas City, Mo.): This splendid address has certainly been interesting to all of us. I move that we show our appreciation to Professor Petersen by a rising vote of thanks.

DR. E. T. FAULDER (New York City): I second the motion.

. . . The audience arose and applauded. . . .
PRESIDENT WESTMORLAND: The next part of our program is the most useless part, and that is the Address of the President. Usually these things take up a lot of time, but I shall try to make it just as short as possible.

. . . President Westmorland read his address. (Applause.)

ADDRESS OF THE PRESIDENT

By D. E. WESTMORLAND, Frankfort, Ky.

State Live Stock Sanitary Board

Members of the United States Live Stock Sanitary Association,

Ladies and Gentlemen:

It is indeed a great pleasure to address you, at this our forty-second annual meeting of the United States Live Stock Sanitary Association.

Investigation of the records shows there has been much progress made from the efforts and work of this organization since its first meetings. It has developed from a small group of Live Stock Sanitary officials interested largely in tick eradication into an association of Live Stock Sanitary officials, scientists and veterinarians dealing with the major problems of live stock disease control and eradication. The policies agreed upon and adopted at our meetings have proved their value when developed into a program and efficiently carried into effect. No better instance can be sighted than our National Bovine Tuberculosis Eradication program which has been practically completed, reducing the occurrence of reactors to a minimum.

Much credit is due this organization and especially many of its members who have devoted much of their time and effort in performing committee duties and analyzing the status of the program as it advanced and recommending such changes in the laws and regulations as were necessary to carry the program along in an orderly manner.

The disease control and eradication programs in which this Association has been vitally interested, can be said to have been based largely on strictly economic value. While, to control and eradicate certain animal diseases is worth while strictly from a dollar and cent standpoint so far as the live stock owner is concerned. It is also interesting to keep in mind the effect of some of our major disease eradication programs, from a public health standpoint. It is generally recognized that the incidence of tuberculosis in humans and the mortality rate from this disease has shown a gradual decrease in proportion to the development of the program in
the eradication of bovine tuberculosis. Another animal
disease that is important from a public health standpoint is
Bang's disease. It is now known that infection with Brucella,
of both bovine and porcine varieties, is not altogether un-
common in man and may be contracted from milk and meat
food products and from contact with infected animals.

Another problem with which we are now confronted is the
question of financial support for continuation of the Bang's
disease eradication program. The United States Congress
appropriated in 1934 a considerable sum of money for a cattle
elimination program, and activities in Bang's disease elimina-
tion was started at that time on an extensive scale and has
continued with subsequent appropriations. In the early period
of the program, government funds were available in all states
for operating expenses and indemnities. Later, some states
appropriated money to assist in the work. It is understood
that the last appropriation bill passed by Congress which
sets aside an amount for Bang's disease elimination specific-
ally states that the fund must be spent only in states who
participate in the payment of operating expenses and indem-
nity on a 50-50 basis. This is to become effective May 1,
1939. Many states have not made funds available for the
continuation of the program, and in most cases there will be
no session of the legislature before the effective date. I am
convinced, therefore, that in some states funds will not be
appropriated to continue the program even on a reduced scale.

We are anxious to hear the report of the committee on
Bang's disease and to know their recommendation in regard
to this phase of the problem. It is hoped that some tempor-
ary, or preferably permanent policy may be adopted and
arrangements made, so the work can be continued in a satis-
factory manner in the states not fully meeting their financial
quota.

Mastitis is deserving of more attention than it is generally
given by Live Stock Sanitary officials, as it causes serious
economic loss. It is also in many instances important from
a public health standpoint.

Hog cholera is prevalent in many sections of the country,
even with the enforcement of usual quarantine measures.
Especially, is the disease on the increase in states where a
number of local live stock sales yards operate with no super-
vision of the movement of animals through these infected
premises. Information available indicates these local yards
are the major source of dissemination of this disease. I am
sure the committee on Transmissible Diseases of Swine will
give you a complete report on hog cholera.
Rabies is at present a problem in many states, especially those that have inadequate laws and regulations to properly control this disease. In some instances, funds are not available to enforce reasonably satisfactory regulations. Possibly some favorable results would be accomplished through more stringent quarantine regulations by states, governing the movement of dogs inter-state. Your committee on Rabies will give you information on this disease.

Equine Encephalomyelitis has been a constantly increasing menace to the horse and mule industry in the United States for the past few years. The area of infection has gradually been extended and the number of animals lost due to the disease has increased from year to year. These facts indicate the necessity of the immediate application of the most effective control measures. Too much publicity has falsely conveyed the impression to the public that the equine population is being exterminated by this disease and horsemen are alarmed, but past experience indicates that the officials in charge of live stock disease control in this country, with the assistance of co-operative agencies will in their usual efficient manner handle this situation satisfactorily.

It has been my purpose to mention briefly some of the most important diseases which have been our major problems during the past year. Our committee reports and papers and discussions will contain detailed information on these subjects which will be of interest to all present.

At the meeting last year the president, Dr. R. W. Smith, called the attention of the Association to the Public Health section of the Social Security Act, stating that the United States Public Health Service had outlined what in their opinion constituted a public health unit, but failed to give the proper recognition to the veterinary profession in assisting with the public health program in general. A motion carried to appoint a committee of four veterinarians and three live stock men to co-operate with a like committee from the American Veterinary Medical Association to contact the proper public health officials and intercede in behalf of the veterinary profession. This committee was appointed and I understand they have made the proper contacts and a majority of the requests made were granted. Still there are details to be worked out. Now the veterinary profession must assume its responsibility and function with efficiency and show an interest in their part of the public health program.

It may be that institutions engaged in veterinary education will be compelled to add to their curriculum to prepare
graduates for this special field of activities. While on this subject, I will say that reports indicate there is a scarcity of veterinarians in practically all phases of veterinary medicine and as all colleges now in operation have their capacity quota of students, it would seem advisable that some survey should be made to determine the number of additional graduates needed annually to meet the demand. We are of the opinion an effort should be made to create the necessary additional colleges to meet this emergency.

I am sure this Association appreciates the efforts of the officers and committees who have devoted much of their time and co-operated so thoroughly to arrange this splendid program, and we are deeply grateful to those who have offered their services to appear on this program, and at this time I wish to commend the excellent and efficient services of our secretary, Dr. L. Enos Day, who is especially qualified for this character of work, and it is through his judgment, courtesy and diplomacy that many of our problems are solved. I hope his services will be continued by this Association.

I wish to thank the members for their presence and extend a welcome to visitors and hope their stay with us will be both pleasant and profitable, and in closing, I wish to thank this Association and each individual member for the honor they have conferred upon me in electing me president of the United States Live Stock Sanitary Association.

Again, I thank you.

PRESIDENT WESTMORLAND: The next is the sad part of our program. Each year we meet here and note the absence of some familiar faces, and are informed that they have passed on to their reward.

At this time we will pause to pay our respects to the departed members in a Memorial Service to be conducted by Dr. J. Leonard Axby, State Veterinarian, Indianapolis, Ind.

... Dr. Axby read the Memorial Service... 

MEMORIAL SERVICE

Mr. President, Members of the Association, Visitors and Guests:

The names I shall read constitute the members of this Association who have died since the last meeting:

Dr. O. E. Dyson, St. Petersburg, Fla., January 10, 1938.
Dr. Maurice C. Hall, Washington, D. C., May 1, 1938.
Dr. John M. Buck, Beltsville, Md., May 3, 1938.
Dr. Henry C. Becker, Chicago, Ill., June 10, 1938.
Dr. F. M. Hayes, Davis, Calif., June 12, 1938.
Dr. Clarence J. Marshall, Philadelpia, Pa., October 29, 1938.

In conformity with our custom long established I respectfully call
upon all present to rise, remain standing with bowed head for one minute and offer a silent prayer for them.

... One minute silent prayer. ...

While it is with regret I report the death of the above members, I find consolation in being able to truthfully say of them, they lived to prove the American ideal is, "That every person has the right to think, has freedom to advance, and is encouraged to be helpful—to be a good neighbor."

They believed the advancement of education is the conquest of ignorance. The advancement of health is the conquest of disease. That the building of character, and the spirit of truth and honor in boys and girls, conquers fear; and where there is no fear there is no oppression, no cruelty.

They recognized it is a wonderful thing to grow up an American citizen, honoring their country's flag and the ideals for which it stands; always willing to lend a hand.

Their lives were as gladdening streams of blessings. They got but to give again, and in giving, were doubly blest. Upon their faces were writ the epic of happiness that comes from caring and sharing.

There are many alive today who are as pools without an outlet, getting all they can, and canning all they get. No trickling stream of good will ever flow from them. Such pools are individually made, and cannot withstand the burning sun of adversity and disappointment, for it drinks its water day after day until reduced to a sorry pesthole of repugnance and regret. In an endeavor to keep, they lost.

Not so the men we memorialize today; they were as a little stream, running down out of the hills singing merrily its way to the sea. Thinking not of the future, except to have faith that the rains will fall on yonder hills and give more water to give away.

The springs in the hills have never failed me yet. I can't help singing because the trees send down their roots for moisture, the birds come to my shady banks to drink, and fill the air with music. Every day little children come and wade barfooted in my pebbly bed. The grasses and flowers rejoice that I pass near to them. I pass my cup around.

The lives of these men portray their hands clutching nothing that could not be passed on; and if all of us practice and emulate their lives, the earth will be filled with music that rises like incense from helpful happy hearts.

Tho' it may seem a paradox,
We only keep the love we give away;
It's sweetness turns to bitterness
If hoarded only for a single day.
Unlike the gold that men so highly prize,
And in pursuit of its great hardships bear,
Love's store is never over-drawn, because
The more we give, the more we have to share.

Shortly before I left Indianapolis to come here I had attracted to my attention the passing away of the wife of one of our old and very highly esteemed members of this Association. There may have been other women who have passed on whom I know not of, and without objection on your part I personally would like to have these remarks
that I shall make in this exercise cover the women, the wives of our members, who have died, equally with the men.

I have especially in mind the wife of our esteemed friend, Dr. E. T. Faulder of New York, whom I have known for so long and have loved so well.

Mr. President, I move that this Service be spread upon the permanent records of this Association, and that a copy be mailed to the families of these deceased members.

DR. FAULDER: I second the motion.

. . . The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: We will call for the report of the Secretary-Treasurer, Dr. Day.

SECRETARY DAY: The financial report of the Secretary-Treasurer for this year is as follows:

Secretary Day read the financial report.

I am very happy to report to you at the present time every state in the United States is a member of our Association, and have paid their dues.

Since 1927 the A. V. M. A. has been printing the proceedings of this convention. At the June meeting last year in New York, the Executive Board of the A. V. M. A. decided that they would not continue to print our Association proceedings in the future; therefore, this year the proceedings will be printed elsewhere, and the March number of the A. V. M. A. Journal will not contain these proceedings.

You who have been receiving the proceedings of this Association through that publication will not be able to do so this year. I would recommend, if you wish to keep your files in this Association intact that you make application at once to become individual members.

Mr. President, may I request you, at this time, to appoint an Auditing Committee to audit the books of the Secretary-Treasurer. Thank you. (Applause.)

PRESIDENT WESTMORLAND: The Auditing Committee will consist of Dr. Cotton, Dr. Zimmer and Dr. Rinehart.

We will adjourn for luncheon.

. . . The meeting adjourned at twelve o'clock.

ADJOURNMENT

WEDNESDAY AFTERNOON, NOVEMBER 30, 1938

The meeting convened at 1:15 o'clock, Dr. D. E. Westmorland, President of the Association, presiding.

PRESIDENT WESTMORLAND: Gentlemen, the meeting will come to order.

This afternoon our program is devoted to the problems of Bang's Disease Control. The first gentleman on the program needs no introduction to this Association, as I am sure he is the best informed man in this country on Bang's disease elimination.

It is indeed a great pleasure for me to introduce to you Dr. A. E. Wight, of the Bureau of Animal Industry, Washington, D. C., who
FINANCIAL STATEMENT

L. ENOS DAY, Secretary-Treasurer

RECEIPTS

Membership dues, 196 at $2.00 .................................. $ 392.00
Members, back and current dues, 2 years, 1 at $2.00 ....... 4.00
Members, back and current dues, 3 years, 1 at $2.00 ....... 6.00
State memberships, 46 at $25.00 ................................ 1,150.00
State memberships, paying current and back dues, 1 at $25.00 50.00
Los Angeles County ............................................. 25.00

REPORTS SOLD—
U. S. Bureau of Animal Industry ................................ 75.00
Canadian Department of Agriculture ............................ 50.00
Miscellaneous ...................................................... 4.00
Interest on U. S. Bonds and Treasury Certificates ...... 172.21
Differential on check .............................................. .25

$1,928.46

Cash balance on hand November 19, 1937 ....................... 2,458.14

$4,386.60

DISBURSEMENTS

Exchange on checks ............................................... $ 7.35
Securities in safe keeping ...................................... 5.20
Postage and express ............................................. 92.12
Reporting 1937 meeting .......................................... 144.90
Clerical hire ....................................................... 12.00
Miscellaneous ..................................................... 47.60
Office rent ......................................................... 20.00
Printing ............................................................. 87.21
Salary Secretary-Treasurer ..................................... 600.00

Total disbursements ............................................. $1,016.38
Cash balance November 25, 1938 .............................. 3,370.22

$4,386.60

CURRENT ASSETS—
United State bonds ................................................ $2,900.00
United States Treasury Certificates .......................... 2,300.00
Cash in bank ....................................................... 3,370.22

Total .............................................................. $8,570.22

LIABILITIES—Statement for printing the proceedings of the 41st Annual Meeting has not been received.

STATE MEMBERSHIPS

Alabama          Kentucky          Nebraska          Rhode Island
Arizona          Iowa               Nevada            South Carolina
Arkansas         Kansas            New Hampshire     South Dakota
California       Louisiana         New Jersey        Tennessee
Colorado         Maine             New Mexico        Texas
Connecticut      Maryland          New York          Utah
Delaware         Massachusetts     North Carolina   Virginia
Florida          Michigan          North Dakota     Vermont
Georgia          Minnesota         Ohio              Washington
Idaho            Missouri          Oklahoma         West Virginia
Illinois         Mississippi       Oregon           Wisconsin
Indiana          Montana           Pennsylvania     Wyoming
Los Angeles County, California    U. S. Bureau of Animal Industry
                                    Canadian Department of Agriculture.

Chicago, Ill., November 25, 1938.
ACCOMPLISHMENTS IN THE FEDERAL-STATE BANG'S DISEASE PROJECT

By Dr. A. E. Wight, Washington, D. C.
Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, United States Department of Agriculture

Substantial progress has been made during the last year in the Bang's disease program being conducted co-operatively by the Federal Government and the state live stock sanitary authorities throughout the United States. It is true that in some states the volume of work, as heretofore, has been much greater than in others. This condition is brought about by various causes. There has been a considerable increase in the number of herds and cattle placed under supervision in the Bang's disease project, and the records indicate that on November 1, 1938, 1,150,000 herds, containing almost 10 million cattle, were under supervision, which is about 18 per cent of all breeding cattle over six months of age. This is an increase of approximately 43 per cent in the number of herds and 22 per cent in the number of cattle as compared with the report issued at the end of October, 1937.

During the fiscal year ended June 30, 1938, agglutination blood tests for Bang's disease were applied to approximately 7,800,000 cattle, contained in approximately 671,000 herds. Among the cattle tested were found about 325,000 reactors, or a little more than 4 per cent. Many of these tests were re-tests, which accounts for the low percentage of infection contained in these reports. The per cent of infection on original test varies to a considerable extent in different localities, running as high as 35 to 40 per cent in some and less than 5 per cent in others.

STATE AND FEDERAL FUNDS

Federal funds made available for the Bang's disease work during the fiscal year ending June 30, 1939, amount to $8,469,000, which is for indemnity and operating expenses. State appropriations for this project during the same period amount to approximately two million dollars, about one-fourth of which is for operating expenses and the remainder for use in the payment of indemnity to owners for cattle that react to the test in state where provision is made for such action.
FEDERAL-STATE BANG'S DISEASE PROJECT

PAYMENTS TO OWNERS FOR BANG'S DISEASE CATTLE

Up until July 1, 1938, the maximum Federal payment for grade cattle remained as heretofore, namely $25, and the maximum Federal payment for registered purebred cattle was $50. The salvage was also received by the owner, and in 12 states the owner received an additional payment from the state, but it was provided that in no case could the owner receive from all sources a total payment greater than the appraised value of the animal. During the last fiscal year the average appraisal of cattle reacting to the test for Bang's disease was $80.37, and the average salvage was $32.07. The average Federal payment during this period was $26.69, and the average state payment was $20.85. Approximately 9 per cent of the reactors were registered purebred cattle.

In the act providing the Federal appropriation for this work for the fiscal year beginning July 1, 1938, it is specified that Federal payments shall be limited to one-third of the difference between the appraised value and the salvage, and, further, that for all cattle slaughtered on or after May 1, 1939, the Federal payment shall not exceed the amount paid by the state or other co-operating agencies. Therefore, it will be noted that provision must be made for co-operative payments if the Federal Government is to make any payment whatever to the owners for cattle slaughtered in the Bang's disease project after May 1, 1939. The time for this plan to become effective was postdated because of the fact that such action would make it possible for all the legislatures to give the matter consideration at a regular session. The average Federal payment in September of this year was $20.81. Ten per cent of the cattle included in the claims were purebred.

THE EXTENT OF BANG'S DISEASE

As indicated in previous reports on the subject of Bang's disease made to this Association, this disease apparently exists to some degree in every locality where cattle are maintained. On the initial test it appears that the average infection in herds thus far tested is about 14 per cent. However, in many localities it is much higher, and in others very much lower. In some counties where the work has been conducted on an area basis, infection has been found to be as low as 1 per cent, and in some of them, slightly less than that. Those in charge of the work are observing this feature quite closely, as it is necessary in connection with outlining plans for future activities in the program to eliminate Bang's disease.
THE METHODS FOLLOWED IN CONDUCTING BANG'S DISEASE WORK

As far as the Federal Government is concerned, this work continues to be on a voluntary basis. The owners who wish to enter their herds under the plan are required to sign an agreement calling for certain action on their part in maintaining the herds in a proper manner. In several states, however, arrangements have been made to conduct work in a systematic manner over a given area such as a county. In connection with this plan all of the breeding cattle over six months of age are tested for Bang's disease. Some of the testing is conducted in the field in some states by thoroughly trained veterinarians, and in others, the blood samples are forwarded to central laboratories. A portable laboratory has been provided for use in four different states and is proving to be very satisfactory.

Under the provisions of the area plan, all the dairy breeding cattle over six months of age in about 255 counties in 21 states have been tested up to November 1 of this year, and this work has also been completed in about 80 townships located in 19 additional counties in one additional state. Area work is also in progress in about 65 counties in two additional states. Therefore, it will be noted that this work has been or is being conducted in 24 states and in about 339 counties. In order that area testing may be conducted in a satisfactory manner in any given area, it is important that the cattle owners in those areas be very much in favor of the work. The degree of infection among the cattle in most of the localities where this work has been taken up has not been high. This is a matter that should be given consideration when area work is contemplated because if the degree of infection is very high, the work must proceed very much more slowly and in a smaller area than when infection is low. The results of the area work thus far conducted show that the percentage of reactors is about 3 per cent on the initial test, and in these areas the tests have been applied to about 2,600,000 cattle. All of the herds in which infection is reported must be retested one or more times and the remaining reactors removed. The herds containing suspects without any reactors must also be retested. The percentage of infected herds in the areas where the work is being conducted has been found to be about 6 per cent, and in these same areas about 3½ per cent of the herds contained suspects only. A complete retest of all cattle has been conducted in 52 of the counties, and reports received indicate that the infection was
about 0.7 of one per cent, and 2 per cent of the herds were found to be infected.

The Bureau of Animal Industry from time to time conducts tests of the antigen used in the Bang's disease work. A special report on the work done in connection with comparative tests of dried sera shipped to the different field laboratories is to be a part of our program today.

RETESTS OF SUSPECTS

The Bureau of Animal Industry has been maintaining records in connection with this feature of the work for some time, and there is given below a summary covering the period from July 1, 1937 to September 30, 1938:

GROUP I—SUSPECTS TO ONE TEST

Number of suspects retested ......................... 71,193

Results:
Negative to retest ..................... 34,678 48.7
Continued suspects ...................... 18,928 26.6
Positive to retest ...................... 17,587 24.7

GROUP II—SUSPECTS TO TWO TESTS

Number of suspects retested ......................... 14,771

Results:
Negative to retest ..................... 6,326 42.8
Continued suspects ...................... 5,228 35.4
Positive to retest ...................... 3,217 21.8

GROUP III—SUSPECTS TO MORE THAN TWO TESTS

Number of suspects retested ......................... 15,546

Results:
Negative to retest ..................... 6,294 40.5
Continued suspects ...................... 5,306 34.1
Positive to retest ...................... 3,946 25.4

In the first group, or those where the animals were suspects to only one test, the percentage of those found positive on the retest was slightly higher than reported last year. In the second group, which covers cases where the animals were suspects to two tests, the percentage of those positive on retest was also slightly higher. In the third group, where the cattle were suspects to more than two tests, the percentage of those positive was exactly the same as reported last year.

FURTHER STUDIES OF VACCINATION

Vaccination of young cattle for Bang's disease has been conducted during the past year, but it is still considered experimental. This work has been conducted at some of the experimental stations as well as in the field. The results continue to indicate that the vaccination of cattle against Bang's disease should be limited to young animals not over eight
months or less than four months of age. In the field experiments now conducted the calves are being vaccinated between the ages of five and seven months. All the vaccine used in these experiments is furnished by the Animal Disease Station of the United States Bureau of Animal Industry. The field project covers the vaccinating of calves in about 267 herds, containing approximately 20,000 cattle. These are located in 25 different states, and the degree of infection in the herds averaged about 30 per cent when the work was taken up. Up to July 1, 1938, approximately 7,300 calves had been vaccinated. It is as yet too early to evaluate results in this field project, but it may be stated that the percentage of abortions in the vaccinated heifers has been very low. There are other features to be taken into consideration in evaluating the vaccination project.

During the last year the Bureau of Animal Industry issued instructions to all commercial firms preparing the vaccine to label the product in a manner to indicate that it should be used on cattle between the ages of four and eight months and that the single dose should be 5 cc. This step is believed to be an important one and should have a good effect in reducing the amount of vaccination of adult cattle.

TESTING MEDICINAL REMEDIES

There has always been a problem confronting cattle owners which has been difficult to solve, and that is the possibility of a medicinal remedy or preventive for Bang's disease in cattle. Various products have been placed on the market from time to time, and during this past year two extensive tests of alleged remedies for Bang's disease have been completed. The results of these tests confirmed previous experience with the testing of such products and proved conclusively that these two also had no value as a remedy or preventive. The facts were made public by a press release.

CONFERENCE AND PUBLICITY ARE HELPFUL

In March of this year a very important conference on the subject of Bang's disease was held during a two-day session at St. Paul, Minn. This conference was called jointly by the live stock breeders' associations of Minnesota and Wisconsin. It was very well attended not only by live stock sanitary officials but by live stock owners who were much interested in what took place. The proceedings of this conference were published in pamphlet form by Mr. W. T. Foley, associate editor of "The Farmer," of St. Paul, Minn. A few other conferences, not so large, were held on the subject in other sec-
tions of the country during the year to discuss the problem of Bang's disease.

During the past year the subject of Bang's disease in cattle and the progress made in its elimination have been given much publicity through the public press and the radio. This publicity has been very helpful to the progress of the work in many sections of the country. In some of the states new publications on the subject of Bang's disease have been made available for distribution by the live stock sanitary officials. It is believed that such action should be taken in more states as the circulars containing a brief description of the disease and methods to combat it are well received by the cattle owners and, undoubtedly, have a considerable effect on bringing about a better understanding of the Bang's disease problem. In view of the fact that there will be no Federal payment available to owners of cattle that react to the test for Bang's disease after May 1 of next year unless the states make an equal or greater payment, it is deemed very important that this fact be given wide publicity. If local funds are not made available for this purpose, it is believed there will be a considerable reduction in the volume of work in those states and much that has been gained in Bang's disease control will be lost.

In September of this year the Bureau of Animal Industry prepared a pamphlet entitled "Sidelights on Bang's Disease Eradication," which contains a map showing the percentage of breeding cattle under supervision in the Bang's disease project on August 1, 1938. Copies of this publication have been distributed, and additional copies are available here at this time.

CONCLUSION

The Bang's disease work has now been conducted on a co-operative basis for a period of about 4½ years. The cattle owners in many sections of the country approve of the program and are determined that it shall proceed, but in order that the work may be successful the fullest co-operation on the part of all concerned is very essential. The fact that the owners of approximately one million cattle, now on the waiting list, located in many different states have expressed the desire for the work to be taken up in their territory, either on an individual-herd or area basis, is striking evidence that there is much demand for the work in various parts of the country. The progress of Bang's disease work will depend to a great extent upon the action taken with reference to it by the incoming state legislatures, many of which meet in January, 1939.
In conclusion it is desired to express appreciation for the excellent co-operation received from the state live stock sanitary officials of this country in connection with this program, as well as many other agencies and people who are interested in the problem. Those actively engaged in the work in the field, laboratory, and office have rendered splendid service and are to be complimented upon their integrity and interest in this great problem.

It has been a great pleasure to appear on the program today before such an appreciative audience so keenly interested in this very important subject.

PRESIDENT WESTMORLAND: Thank you, Dr. Wight, for your splendid paper. The subject is open for discussion. Does any one have any question he would like to ask Dr. Wight?

If there are no questions, we will proceed with the program.

The next topic is a very interesting one, "Some Pertinent Remarks on Abortion Disease Control," by Professor L. F. Rettger, Yale University, New Haven, Conn. (Applause.)

. . . Dr. Rettger read his prepared paper.

SOME PERTINENT REMARKS ON BANG'S ABORTION DISEASE DIAGNOSIS AND CONTROL

By Leo F. Rettger and Wayne N. Plastridge
Yale University and Storrs Experiment Station

My remarks today are born of 25 years of almost continuous research on Bang's disease at the Storrs Experiment Station, from which have appeared some 15 station bulletins and Journal articles on the subject.

A large part of our time and energy was devoted in the earlier years to a critical study of serological diagnosis by the use of both the agglutination and compliment fixation tests. These two methods were run as checks on each other and were often conducted repeatedly on the same animals over periods of years. So consistent were the results that we adopted these tests early as the basis for establishing a system of Bang's disease diagnosis and eradication, since known as the Connecticut System. This system also took into serious account the fact established by us that calves react to the tests as their dams do, but that, with very rare exceptions, all calves, whether from positive or negative dams, are non-reactors when they enter the period of sexual development. In other words, that reacting calves gradually become non-reactors and are Bang bacillus free by the time
they are six or seven months old, and remain so indefinitely, unless they become infected from without. Furthermore, we found that young calves do not acquire the infection readily on exposure to infected animals, being relatively immune, as compared with sexually maturing and mature animals.

I am making these preliminary statements as my excuse for dealing rather boldly here with the problem which is commanding our serious attention at this session today.

We hear rumblings in some quarters against the present-day widely adopted system of Bang's disease control; and we may well give heed to some of these criticisms, and ask ourselves the question, Are we promising more to cattle owners than we are able to deliver? and, What can we do to gain and keep their full confidence?

In a recent issue of the Journal of the American Veterinary Medical Association (October, 1938) Dr. A. N. Carroll concluded his article as follows: "Somewhere there is a middle ground, or happy medium in the control of Bang's disease. Let us accept known facts and work out a practical program."

I cannot subscribe to such a program, if it may be dignified by the word "program." I am convinced that, for the real solution, or even near solution, of the problem of Bang's disease eradication—and eradication must be the ultimate goal—there is no "middle ground." Where dairy owners are willing to experiment with, and adopt halfway or compromise measures and knowingly choose a so-called middle ground, I have no quarrel with them or the Bang's disease control agencies who supervise such a program, providing such authorities attempt to educate the owners to the point where they are willing and sufficiently informed to go ahead later with a definite system of ultimate eradication.

There was no middle ground for the real control of bovine tuberculosis, although only a few years ago tuberculin testing with a view to eradication met with country-wide opposition, not only from cattle owners, but also from a large part of the veterinary medical profession. Advocates of, and agents engaged in, tuberculin testing were often themselves responsible, through lack of training and good judgment, for delaying the day when all of our 48 states were pronounced happily as "tuberculosis free," using this term in the practical, rather than the absolute sense.

By the adoption of the Federal Plan of Bang's disease diagnosis and control the various states of the country have committed themselves to a definite system of control. This system has, however, some decidedly vulnerable spots. It did not
follow a general campaign of education of cattle owners, and will not function correctly until the educational phase has caught up with the machinery of operation of the system on such a large scale.

The system itself needs tightening up. First of all short-cut methods of testing are wooed in some quarters. I am confident that the longer we dicker over the possible merits of the serum plate method and the whole-blood rapid test the further we delay solution of the Bang's disease control problem. Neither of these two tests can be applied with sufficient accuracy to establish clean herds and maintain them as such. Both tests permit of too many suspicious or doubtful reactions; and, it is on the border line of reaction between positive and negative where our main difficulties lie. Further what makes these so-called short methods particularly unsound is their falling into the hands of untrained and un-qualified "blood testers." The diagnostic blood tests should be vigorously restricted to well trained scientifically minded persons, and carried out in laboratories which are responsible to higher authorities. This is a matter of highest importance. The method of testing and its execution constitute the ground work on which the whole control system is built.

The standard tube agglutination method has demonstrated its merits, as has been shown by various investigators, including Barnes and Fitch, who supervised series of multiple check tests conducted simultaneously in various recognized laboratories. These demonstrations are matters of record, and can be added to by volume of more recent observations, including those of Plastridge and myself at the Storrs Experiment Station. The following table presents such evidence:

TABLE I
Comparison of Results of Repeated Tests

<table>
<thead>
<tr>
<th>Number of herds</th>
<th>Number of animals</th>
<th>Number positive on first test (State test)</th>
<th>Results of 2nd test on same animals* (Federal test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Infected - 21</td>
<td>938</td>
<td>206</td>
<td>196</td>
</tr>
<tr>
<td>Negative - 19</td>
<td>665</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Tests made from 1 to 5 months after first test.

Per cent agreement of tests made on positive animals—95.14.

Per cent agreement of tests made on negative animals in herds negative on state test—0.15,
As you will see here, agreement on the positive animal is 95.14 per cent, and on the negative, 0.15 per cent. Allowance must be made for actual changing conditions in the animals, especially in herds that are undergoing increasing infection, and more particularly so-called “abortion storm” herds. On the other hand, where animals have become adjusted or more or less “stabilized” to the infection, and infected animals have become, with rare exceptions, “confirmed reactors,” tests conducted on the same animals at different times give remarkably consistent results, when carried out properly.

Cows which were negative to the Bang’s disease test occasionally aborted, but the act was, with rare exceptions, due to causes other than the Bang’s bacillus. The following table presents such evidence for 32 premature fetuses examined by us.

**TABLE 2**

Results of Bacteriological Examination of Fetuses and Placentae from Cows in Herds Free from Reactors to the Agglutination Test for Bang’s Disease

<table>
<thead>
<tr>
<th>Number of fetuses examined</th>
<th>Organisms isolated</th>
<th>Number of fetuses yielding cultures</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>None</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Streptococci*</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Corynebacterium pyogenes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Staphylococci</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Coliform organisms</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pseudomonus pyocyanea</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Mold</td>
<td>1</td>
</tr>
</tbody>
</table>

*Weakly hemolytic unidentified streptococci. None possessed the characteristics of *Streptococcus agalactiae*.

The most common organisms identified were streptococci, staphylococci and diphtheroids. Bangs’ bacillus was not observed here in a single instance.

The suspicious reactor will perhaps always be a major problem in the serological diagnosis of Bang’s disease. There are still some who maintain that animals must be either infected or not infected, and therefore reactions should be recorded as positive or negative. With such views we have no sympathy. On the other hand, large numbers of suspicious reactions in any given herd test should as a rule be regarded as reflecting unfavorably on the method used, or on the com-
petency of the technicians, or both. There may be occasional instances in which there is a general and rapid spread of infection in a herd, when several animals are passing through the partial to the complete reaction phase.

Upon the proper disposal of suspicious reactors depends in a large measure the success of control programs. The Federal System of indemnity payment helps in a large measure to answer the important question of what shall be done with the positive reactor. But no definite provision is made for the immediate removal of the suspicious reactors from the herd, particularly those which are in the weakly suspicious column. All suspicious reactors must be looked upon for the moment as a potential menace to the herd, and should be separated from the rest of the herd, and kept apart, until at least one or two follow-up blood tests are made.

Occasionally an animal will continue to give a suspicious reaction over long periods of time. One such animal under our observation gave partial reactions regularly over a period of 10 years. There were no positive reactors in this herd at any time.

As a rule, animals giving a suspicious reaction with Brucella abortus react more strongly or become positive to the test within the next 10 to 14 days, if the infection becomes at all established; or, they become weaker or negative reactors if there is no infection with Bang's bacillus or if the organism fails to gain a permanent foothold. As will be seen in the following table, the significance of suspicious reactions depends to a large extent on the status of infection in a given herd. For eradication purposes, suspicious reactors in herds in which there is increasing infection, or where there are indications that infection is not stabilized, should be re-

| TABLE 3 |
| Incidence and Significance of Suspicious Reactions in Different Herds |
|-----------------|-----------------|-----------------|-----------------|
| Status of herds as determined by previous tests | Number of tests | Suspicious animals | Suspicious animals positive on subsequent tests |
| | Number | Percent | Number | Percent |
|-----------------|----------------|----------------|-----------------|
| Negative on one or more tests | 4802 | 24* | 0.50 | 4 | 16.6 |
| Infected - slow spread of infection | 3102 | 53 | 1.71 | 19 | 26.0 |
| Infected - rapid spread | 2787 | 33 | 1.25 | 21 | 65.6 |

*Mostly weakly suspicious reactions,
garded as infected and disposed of along with the positive reactors. Suspicious reactors in previously negative herds or in which spread of infection is slow or apparently arrested for the time being, should be isolated and retested within the next 10 to 15 days.

TESTS REQUIRED TO ELIMINATE INFECTION

The following data were obtained on 149 different herds tested by us under the Federal Plan, using the standard tube method:

- 64.5 per cent of the herds required not more than two tests.
- 22.7 per cent required from three to four tests.
- 12.7 per cent required more than four tests.

In the 13 per cent of herds found on initial tests to be infected and to require more than four tests to eliminate the infection, the rate of spread of infection was rapid. The requirement of the larger numbers of tests may be explained on the well supported assumption that new infection in individual animals occurred so recently before the last test that insufficient time elapsed for detectable amounts of agglutinin to be produced in the animals. This new infection then became the nucleus of new infection following the last test.

The problem of maintaining herds free from infection requires even more thought and vigilance than the establishing of Bang bacillus free herds.

One herd under our observation for 13 years became infected by pasturing heifers with heifers from an untested herd. A total of 13 out of 50 animals became positive within a year. This herd was cleaned up and has remained free during the past six years. Two of four herds under observation for 12 years remained free during the entire period.

Of 218 herds under study for periods of from two to 13 years following complete elimination of infection, 67 became reinfected. In 26, or 38.8 per cent of the 67 reinfected herds, the number of reactors was only one; and in 52 others, or 77.6 per cent, the reactors were five or less. Reinfection assumed serious proportions in nine, or 13.4 per cent of the 67 herds.

The numbers of tests required to eliminate reinfection from 65 of the 67 herds were as follows: 29 herds, or 44.6 per cent, were negative after one test; 54, or 83.1 per cent, after two to five tests, and three required more than 10 tests.

Sixty-seven breaks in 218 herds may appear large to us. It must be remembered, however, that these observations were extended over a period of 13 years, and that, at least
during the earlier years, some of the many holes in the control system were not plugged. In other words, we felt our way as we went along, the work all along being of an experimental nature.

The system of abortion control now quite generally followed, and what should develop into a uniform federal or state system, rests upon a sound foundation and, we believe,

**TABLE 4**

<table>
<thead>
<tr>
<th>Length of Time Herds Have Remained Free from Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years of Observation</strong></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

will lead to the dairymen's promised land, so far as the Bang's disease problem is concerned. However, before ultimate success is attained, the entire system must be tightened up. To make it puncture proof the following important measures must be carried out rigidly:

1. Reliable method of blood testing and of executing it and interpreting the results.
2. Tests made at frequent intervals, even as often as once in two months, or even less time, as part of an intensive elimination program.
3. Immediate removal from the herd of all animals giving a positive and suspicious agglutination reactions.
4. Retests within 10 to 15 days of all animals giving partial reactions in 1:50 dilution of the serum.

5. Use of maternity stalls.


7. Extreme precautions against introduction of infection by the addition of new animals which are not known to be clean; by pasturing stock with animals of unknown Bang disease status, or in pastures adjoining premises occupied by animals of unknown or positive status.

8. Strict quarantine and early retest of all animals that have been off the home premises, before they are returned.

We may safely assume that, in order to carry out some of these measures in their entirety, area testing will be necessary; indeed, we cannot conceive how what should be the ultimate aims of a generally adopted system of Bang's disease control can be realized without full resort to area testing.

Vaccination has, it seems, still to establish its merits. Whatever its merits, if it has any, vaccination against Bang's disease is incompatible with any system of blood testing and elimination of disease by removal of infected animals. Vaccination often causes animals to react to the agglutination test, and thus vitiates the value of the test. You might as well try to mix corn syrup and machine oil and call it maple syrup.

My remarks have dealt largely with what I believe must be the ultimate goal of effective control measures, namely, elimination of all infection. Where such a system is not adopted and only a compromise program is being carried out, for the blood testing and control measures are in the hands of incompetent persons, the promised land will be but a mirage.

PRESIDENT WESTMORLAND: Dr. Rettger, we wish to thank you for this paper.

The report is now open for discussion.

DISCUSSION

DR. J. W. OLTMAN (Watseka, Ill.): Do you think one is justified in branding a cow with the letter "B" on the left jaw if the test is positive when she gave birth to a calf the day before the blood was drawn for the test, and in view of the fact that she came from a clean herd which had passed three consecutive tests? A purebred heifer and a cow, members of the herd into which this particular cow was introduced were suspicious to the test at the time the cow was tested. Under these conditions is one justified in branding such an animal?

I have always understood that the Bang test is not reliable if the blood is drawn within 30 days after calving. Am I correct?
DR. RETTGER: The question involves so much, I think it would be a mistake for me to answer it.

DR. C. P. FITCH (St. Paul, Minn.): May I have the opportunity of presenting a few figures in connection with Dr. Rettger's report?

PRESIDENT WESTMORLAND: Certainly, Dr. Fitch.

DR. FITCH: We have been thinking for a good many years that there was some difference in susceptibility between males and females. In order to get a little more data upon this subject we have tabulated 2,592 males and 33,077 females, which represent first tests. I am going to present two sets of figures. These represent the first tests. They are divided into groups of one year of age and over, and less than one year.

Males, 2.3 per cent reactors; females, 11.1 reactors.

In other words, indications were that there was about five times as much infection among the females as the males.

In the regular run of tests, which include both first tests and re-tests, in animals one year of age or older we tested 1,958 males and 25,677 females. There were 1 per cent of males and 3.4 females reacting, bearing out the figures on the first test.

In order to get some data on infected herds and their ability to clean up, we tabulated 12,018 herds which were positive on the original tests. Upon retests, 6,392 or 53.2 per cent were negative on the first retest. Of the infected herds left on that retest, and retested the second time, 1,389 or 48.4 per cent were negative. On the third test, the third retest of the infected herds left on the second retest, 46 per cent became negative. On the fourth retest (and notice that the number is very materially diminishing each time), 237 or 44.4 per cent became negative. I haven't the figures tabulated beyond that, but the percentage of negative herds decreases materially after the fourth retest. Thank you. (Applause.)

DR. OLTMAN: In my opinion I have not received an answer to my question. No doubt the veterinarian was qualified. By what authority or knowledge can he conscientiously condemn an animal that calved yesterday and was considered positive today? I would like to have this question answered by you men who know more about it than I.

DR. RETTGER: I think I covered that in my paper. Our policy has been to find the history of the herd and the origin of the stock. When a herd is negative it is not fair to condemn the entire herd.

DR. OLTMAN: Are you conscientiously condemning an animal that dropped a calf yesterday, and was tested today? Might she not be negative in 30 days?

DR. RETTGER: That is what I mean.

DR. OLTMAN: Are you condemning it?

DR. RETTGER: I am not condemning anything.

DR. T. H. FERGUSON (Lake Geneva, Wis.): As I have understood the test in the past, if an animal is negative at the time of parturition or abortion, or shortly prior to or directly afterwards, a negative test is not reliable, whereas a positive test is reliable, if my understanding is correct, the veterinarian did his duty when he applied the hot iron on the cow.

PRESIDENT WESTMORLAND: Are there any other questions on Dr. Rettger's paper. If not, we will proceed with the program.
The next paper will be “The Control of Brucella Agglutination Antigen by Means of Dried Serum,” by Mr. Robert M. Chapin, Mr. Jacob M. Schaffer and Mr. Percy W. LeDuc, of the Bureau of Animal Industry, Washington, D. C. (Applause.)

... Mr. Robert M. Chapin read the prepared paper.

THE CONTROL OF BRUCELLA AGGLUTINATION ANTIGEN BY MEANS OF DRIED SERUM

By Robert M. Chapin, Jacob M. Schaffer and Percy W. LeDuc, Washington, D. C.

Biochemic Division, Bureau of Animal Industry, U. S. Department of Agriculture

The use of dried bovine serum for the standardization of Brucella agglutination antigen was described by Dr. Stableforth of the Royal Veterinary College, London. Serum of rather high titer from a naturally infected cow was passed through a bacteria-proof filter, and accurately measured into sterile ampules. Drying was effected over phosphorus pentoxide in a desiccator evacuated to a pressure of 1 millimeter or less. The ampules were filled with pure nitrogen before being sealed. Stableforth reported that this serum, reduced to absolute dryness and stored at a temperature below 4° C., retained a constant titer for the two and one-half years during which it had been held under observation. It was reconstructed for use by solution in its original volume of sterile distilled water at 37° C., from 30 to 60 minutes being required to obtain a homogeneous, slightly turbid solution.

Shortly before Stableforth’s paper appeared, Flosdorf and Mudd described a new apparatus for drying biological products while in a solidly frozen condition. Because the water was merely sublimed from solid material, the residue was a bulky, porous mass of exceptionally rapid and complete solubility, properties in which Stableforth’s dried serum obviously was somewhat deficient. During a delay incident to obtaining the Flosdorf-Mudd “Lyophile” equipment, the Biochemic division experimented with the Stableforth process, and the junior author eventually incorporated certain features of the Flosdorf-Mudd process into an apparatus which has been used with considerable success for drying biological materials. It is illustrated in Figure 1.


In the routine drying of cattle serum the material is delivered from an accurate syringe in 1-cc. portions into 1-drachm homeopathic vials inserted in the clip (capacity 10 vials), which rests across the side rims of a rectangular pan 18x5½x2 inches, inside dimensions. When all vials (not in excess of 220) for the run have been charged with serum, a similar pan is partly filled with high percentage alcohol, and crushed solid carbon dioxide, obtained in the form of commercial "dry ice," is added until the temperature approaches the minimum limit of about —78° C. The clips of charged vials are transferred to this freezing bath. In order to enlarge the surface of the frozen serum, it is well to introduce the vials into the bath in an oblique position, and to that end it is advantageous to conduct the freezing in a shorter and wider pan equipped with lugs or slots for holding the clips in the desired canted position. It is necessary to add more "dry ice" at frequent intervals, with care that the alcohol does not froth into the vials at any time. Transverse partitions of wire screening to confine the "dry ice" are a useful safeguard.

The drying apparatus will already have been set up and tested for leaks by observing that the manometer indicates well below 1 mm. pressure. When all the serum for the run...
has been frozen, the clips are hung on the rack, which stands on the inverted desiccator cover; the desiccator jar is set on the well greased cover; the evacuation pump is started, and the vacuum jar is immediately filled with alcohol-carbon dioxide freezing mixture. All these operations are conducted so speedily that the serum has not time to thaw. With proper equipment and operation, the water is so rapidly evaporated from the frozen serum that the conversion of kinetic heat into latent heat of vaporization suffices to keep the serum frozen until it becomes nearly dry.

Success in the operation requires considerable skilled attention by the operator, particularly when the volume of serum being dried approaches the maximum capacity of the apparatus. Should the serum begin to thaw it is very likely to froth out of the vials. The operator must see to it, at the possible cost of a trip during the night, that a liberal supply of “dry ice” in the vacuum jar is maintained. But the level of the freezing mixture must not be allowed to rise much higher than shown in the figure, else an ice bridge may completely plug the lower opening of the metal tube. This tube is as wide as can be fitted through the rubber stoppers and as thin-walled as can be trusted to withstand the mechanical stresses and strains, including those of evacuation.

After 18 to 20 hours the apparatus is closed off from the pump and manometer by means of a three-way stop-cock in the evacuation line, and air is let in. The receiver is at once removed and replaced by another similar 1-liter filter flask which contains about 50 grams of phosphorus pentoxide. No freezing bath is used during the final drying. The pump is run only enough to keep the manometer pressure below 1 millimeter. Complete dryness will be reached in 18 to 20 hours. Then dry air is let into the apparatus, the vials are immediately closed with sound, soft corks, and the corks, along with the lips of the vials, are sealed as soon as possible by being dipped in melted soft paraffin wax.

The vials should be kept dry, cool and unopened until the contents are required. Evidence of deterioration in properly prepared and stored material has not yet been observed. But if the vials are imperfectly sealed the serum eventually becomes imperfectly soluble. Such samples should be rejected, for their titers are certain to have decreased seriously. In reconstruction, 1 cc of distilled water at room temperature is added to the dried serum in a vial and the contents are gently agitated until a uniform solution results. The reconstructed serum should be used as soon as practicable.
The first few lots of serum for drying were obtained from experimental cattle in possession of the Animal Disease Station of the Bureau. But it was soon decided that the serums would be more widely representative if derived from naturally infected animals. On a day when animals from an infected herd are scheduled for slaughter at a commercial packing house, members of the staff carry to the plant a number of 1-gallon milk cans and an outfit for performing the rapid whole-blood agglutination test for Bang’s disease. When an animal is bled on the killing floor a canful of blood is caught, the whole-blood test is immediately applied, and the can is set aside for clotting of the contents if the titer is satisfactory. After the blood has reached the laboratory the serum is strained from the clot, centifuged and passed through a sterilized Berkefeld filter. Sterilized containers and utensils are employed for holding and transferring the filtered serum.

THE SYSTEM OF CONTROL

The system whereby dried serum has been utilized by our laboratories for the control of Brucella agglutination antigen is fundamentally democratic. Dried samples of a given serum are simultaneously sent to all the testing laboratories which are co-operating in the project for combating Bang’s disease in cattle. The recipients are requested to reconstruct the serum, to test it by the method and with the antigen routinely employed, and to report the readings obtained at the various dilutions. After all reports have come in, the readings of the various laboratories are combined to strike an average and this final average reading is reported back to each of the participants in the experiment. It then rests with each laboratory to decide how it should modify its antigen and technique in order that its results thereafter may more closely agree with the results of other laboratories. In order to facilitate such adjustments the Biochemic Division has endeavored to accumulate an ample reserve supply of serums, so that, once the average titer of a serum has been ascertained, any participating laboratory may obtain additional samples for such subsequent control tests as it may wish to make.

In practice, the dried serums have been usually sent out in groups of nine, each group containing a serum that is negative in a dilution of 1 to 25 and another that is positive in a dilution of 1 to 400. Four such nation-wide surveys have been completed in addition to a preliminary trial on a smaller scale. In one of the surveys a vial of serum-plate antigen taken from a single batch prepared by the Biochemic Division was sent with the serums to each laboratory employing
the serum-plate method of test. A comparison of readings reported by use of the uniform antigen with those reported by use of the regular station antigens afforded a basis for judging the relative importance of the two factors, antigen and technique, in the lack of concordance between various stations.

EVALUATION OF THE FIELD REPORTS

After all reports from the field on a group of serums are in hand the individual readings at the various dilutions are first entered in vertical columns on large sheets, one for the tube method and another for the plate method. It was early apparent that the two methods must be regarded for the purpose in view as wholly distinct methods of test and that the two sets of data required separate evaluation. Some laboratories do not obtain readings at the highest or lowest dilutions commonly employed, and in such cases extrapolations are made wherever there is clear indication of the probable reading. For example, a report of (I) at 1:50 indicate that (+) would have been obtained at 1:25, and a report of (I) at 1:200 indicates (—) at 1:400. The next step is to count and tabulate the readings for a given serum, as shown in table 1 for the important range of readings on Serum No. 49. The third step is to weight the results in order to determine the most nearly representative average reading for each dilution. The process of weighting is illustrated in table 1. In weighting, one unit is allowed for full agreement and 0.5 unit for semiaagreement, that is, for (+) against (I), and (—) against (I). In table 1, dilution 1:50, the sum of the weightings for a (+) reading is 26 and the sum for an (I) reading is 25.5 Therefore the average reading is taken as (+), though obviously it is almost equally close to (I). Division of the sum of the weightings for any dilution by the total number of readings at that dilution gives the ratio of agreement.

After the average titers of all serums comprised in a group have been determined, the final step is to calculate the percentage of agreement on the group as a whole. In order that valid comparisons may be made between different groups, it is first of all necessary to reject all serums which are not of definite critical significance. Only those are retained for tabulation which show in their average titers a reading of (+) at 1:25 and (—) at 1 to 400. The individual readings on these selected serums are tabulated and weighted against the average titers, with distinction between tube method and plate method, and then the ratio of agreement with the

---

1 Agglutination complete, (+); partial, (I); none, (—).
average titers is calculated in a manner parallel to the treat-
ment of a single serum illustrated in Table 1.

FIGURE 2

Percentage agreement among all field reports on serum of critical
importance.

T — the mean "titer dilution," i.e., the highest average dilution in
which agglutination was evident (+ or I).

SERIES I
5 SERUMS

SERIES II
3 SERUMS

SERIES III
7 SERUMS

SERIES IV
8 SERUMS

Figure 2 graphically shows the percentage of agreement
on each of the four groups of serums. The central bar for
each group measures the percentage of agreement at those
dilutions representing the average "titer dilutions" of the
serums, that is, the highest dilution in which agglutination
was either (+) or (I); the left bar measures agreement at
one-half those dilutions and the right bar at twice those dilu-
sions. From the figure it appears that, for example, when
the average "titer dilution" of a serum is 1:100, there can be
expected to be, under present conditions, about 95 per cent
agreement on the reading at the dilution of 1:50, and above
85 per cent agreement on the reading at 1:200, although there
is naturally more difference of opinion on the reading at
1:100.

It will naturally be asked how well the results by the two
methods, the tube and the plate, agree with each other when
both methods of test are applied to the same serums. The
differences in the average titers of all individual serums com-
prised in the four groups sent out are summarized in Table 2.
Evidently, where differences have occurred, the tube method
usually has tended to give the higher reading.

Another natural question is which method, the tube or the
plate, shows the higher percentage of agreement among the
individual results by that method. Figure 3 (a) indicates no great difference, the plate method being perhaps a little superior at dilutions below the "titer dilution," though inferior at higher dilutions.

FIGURE 3

Percentage agreement among classified field reports on serum of critical importance.

(a) Comparison between tube and plate methods; (b) comparison between uniform and non-uniform antigens in plate methods.

T + the mean "titer dilution," i.e., the highest average dilution in which agglutination was evident (+ or I).

In Figure 3 (b) is shown a comparison between the percentages of agreements on the serum-plate test when the testing laboratories used their regular antigens on the one hand and the uniform antigen sent from the Biohemic Division on the other. The use of a uniform antigen clearly resulted in definitely better agreement.

SUMMARY

Bovine serums from cattle naturally infected with Bang's disease are frozen in measured portions, dried while frozen, and reconstructed for use by the addition of water.

These dried serums are distributed to testing laboratories, the results are assembled, and the average readings are determined. The average reading so obtained is then regarded as the standard titer of each serum.

Data summarizing results are presented in figures and tables.
TABLE 1

Summation of results by tube method on serum No. 49.
Reported and weighted readings\(^1\) at dilutions of:

<table>
<thead>
<tr>
<th>Dilution</th>
<th>Reported readings</th>
<th>Weighted for (+)</th>
<th>Reported readings</th>
<th>Weighted for (I)</th>
<th>Reported readings</th>
<th>Weighted for (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:25</td>
<td>35 (4)</td>
<td>35</td>
<td>20 (4)</td>
<td>20</td>
<td>2 (4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 (1)</td>
<td>0</td>
<td>12 (1)</td>
<td>6</td>
<td>9 (1)</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>3 (-)</td>
<td>0</td>
<td>7 (-)</td>
<td>0</td>
<td>3.5</td>
<td>28 (-)</td>
</tr>
</tbody>
</table>

Average reading, (+) 35 = \(0.92\)

Ratio agreement
\[ \frac{35}{38} = 0.92 \]

Average reading, (I) 26 = \(0.67\)

Ratio agreement
\[ \frac{26}{39} = 0.67 \]

Average reading, (-) 32.5 = \(0.83\)

Ratio agreement
\[ \frac{32.5}{39} = 0.83 \]

\(^1\)Agglutination complete (+); partial (I); none (-).

TABLE 2

Differences between titers\(^1\) by tube and plate methods.

<table>
<thead>
<tr>
<th></th>
<th>+ +</th>
<th>+ I</th>
<th>+</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number serums of higher titer by tube method.</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Number serums of higher titer by plate method.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

\(^1\)Agglutination complete (+); partial (I); none (-).

PRESIDENT WESTMORLAND: Mr. Chapin, we thank you and your associates for this most interesting paper.

The paper is now open for discussion. Are there any questions? If not, we will proceed to the next topic.

"The Range Cattleman's View in Bang's Disease Control," by Mr. J. Elmer Brock, First Vice-President of the American National Live Stock Association, Kaycee, Wyo. Mr. Brock. (Applause.)

... Mr. Brock read his prepared paper.
THE RANGE CATTLEMAN'S VIEW OF BANG'S DISEASE CONTROL

By J. Elmer Brock, Kaysee, Wyoming.
First Vice-President of the American National Live Stock Association

It would obviously be futile for a layman to attempt to discuss the technical nature of Bang's disease before this body of scientific men. I shall, therefore, confine my remarks to the existing and proposed method of eradicating this malady in cattle as they affect the range cattleman, whose cattle are almost entirely of the beef breeds.

Our purpose here is two-fold. First, insofar as beef cattle are concerned, we urge that available funds be used to find a more practical method of eradicating Bang's disease, and that experiments be applied to test herds rather than to the beef cattle industry as a whole.

Second, we vigorously oppose the efforts on the part of B. A. I. field men and certain state officials to set up area work in the range country. The official attitude of the Bureau itself is most commendable and is expressed clearly in a letter of June 29, 1938, from Dr. John R. Mohler, Chief of the Bureau of Animal Industry:

"... There is enclosed herewith a copy of the most recent report on the Bang's disease work, which is accumulated from the time it was taken up in a co-operative manner in July, 1934. In this connection I can only reiterate what I have already told you in person as well as in my letter of June 21, 1938, viz.: that there has been no change in the policy of this Bureau regarding the compulsory feature of Bang's disease work, and so far as I am concerned it will be conducted on a voluntary basis for a considerable time to come."

We heartily concur in this policy.

Despite this assurance it is evident to anyone who has followed the Bang's disease program carefully that the commencement of area work in many states is now being pushed
and that this inevitably leads to a compulsory program. The quarantine barriers necessary to accompany area work would in themselves be a serious blow to the cattle industry.

According to a letter from the Acting Chief of the Bureau, dated September 17, 1938:

"This Bureau is co-operating in the conduct of Bang's disease work under the area plan with the state livestock sanitary authorities in about 22 states, but this activity is being carried on under the authority of the states concerned."

Compulsory methods are already being invoked in various ways. In Nevada the livestock men running cattle on certain Indian reservations were obliged to test all cattle for Bang's disease. This is supposed to be because the Indians themselves voted to impose this requirement, but is anyone so naive as to believe that some field men did not inspire the Indians to take the action specified. In Oregon, where B. A. I. men have been very active, at a recent meeting of Oregon veterinarians the following suggestion was made:

"It was reported that an order from U. S. Forestry officials requiring Bang's testing to qualify for United States grazing allotment would help greatly."

A further instance of this nature occurred in a western state last June when the B. A. I. agent publicly announced a four-county area drive to stamp out the disease, although the state veterinarian in that state has been entirely in accord with the policy expressed by Dr. Mohler that the work should be conducted on a voluntary basis. It is already well established in several states that area work leads to compulsion.

During the drought of 1934 the federal government started a cattle purchase program that spread to the drought areas of 23 states. While this program was in progress and in order that dairymen could dispose of surplus animals outside the drought area at more than their actual value as canners or cutters, arrangements were made to start the emergency Bang's disease program out of funds provided under the Jones-Connally Act. The program was sponsored by the dairy people as a substitute for a program under consideration by the AAA which suggested removing from the herds of the dairymen, strictly as a cattle reduction measure and in order to control milk production, the two and three year old heifers which were within six weeks of calving. The dairymen wisely took the position that it would be better first to remove from the herds the diseased animals. Since that time, with emergency funds of one kind and another available in almost unlimited quantities, the Bureau has ex-
panded the program more rapidly, we believe, than practical
considerations would warrant.

This clearly indicates that the present Bang program was
started as an economic program to reduce dairy cattle num-
ers, rather than as a sanitary measure. I speak with definite
knowledge in saying that the Bang's disease program was
but one of four methods urged in 1934 by Federal authority,
to reduce the cattle population of the U. S. The others were
restriction of credits by the Farm Credit Administration,
cuts in forest grazing permits, and reduction of numbers
in newly created grazing districts on the public domain.
That the Bang program did little more than reduce cattle
numbers is evidenced by numerous cases which have come
to our attention.

I quote you from some of them:

Case No. 33 (Dairy herd)—Variable number running from slightly
less than 100 up to approximately 150 head. Twenty-two tests were
made in a period of three and one-half years, and although there
were only one reactor and two suspects in the first test, there has
been only one test out of the 22 in which there did not show some
reactors or suspects, there being at different times as many as 11
reactor and 25 suspects. In July, 1938, there were one reactor and
25 suspects; three months later, no reactors and three suspects; one
month later, no reactors and two suspects. A total of 44 reactor was
taken out of the herd in three and one-half years. Still under the
government plan and still not cleared up, despite 22 tests.

Prior to the July test referred to before, 25 mares on the place
were tested for Bang's disease, results showing four reactors, 12 sus-
psects, and nine negatives. Since the date on which they were tested,
horses have not been used in the cattle barns or allowed to go in
the cattle pastures, and since that time it is noted that there has
been a decrease in the number of reactors and suspects in the dairy
herd.

Case No. 9 (Range cattle)—Unit starting with 205 head and main-
tained to approximately that number by replacements. Six tests
were made in little less than a three-year period under supervision
of a state agricultural college in its experimental work on Bang's
disease control. One hundred and ten cattle were taken out in the
six tests. There were 20 abortions before the last test was made
and 46 reactors in the last test. The college then discontinued the
work.

The owner continued the program under government supervision
and made six further tests during which 56 reactors were found, there
being two reactors in the last of the total of 12 tests. Owner then
discontinued the test for the reason that he could not continually
run his cattle through the chutes. Doubtless the cattle were tired
of the chutes also. Herd still not clean despite 12 tests.

Case No. 7 (Dairy herd)—First test started with 192 cattle, at
which time there were 39 reactors and 11 suspects. Seventeen tests
have been made in a period of approximately four years, and in only
six tests have there been no reactors, while in only one test have
there been no suspects. The next to the last test in the summer of 1938 showed two reactors and 12 suspects; the last test three months later showed no reactors and three suspects. Total number of reactors taken out in a four year period, 68; but herd has been kept up to practically uniform size in replacement. Still under program.

Doubtless the chaotic conditions that are portrayed above, and in many similar cases of records are partly due to the different results that seem to be obtained from the same samples at different laboratories. This may be partially due to the variation in the antigen used as the agglutination agent; it may be due to variation in state regulations. At any rate it is certain, as stated before, that frequently one laboratory will pass an animal as negative while another laboratory, perhaps in a different state, tags it as a reactor.

Obviously no fair-minded man, after a study of such cases reported by men who have co-operative in the Bang's program, could conscientiously suggest either a compulsory program or area work in our territory.

It might be recalled that when the tuberculosis program was under way a modification was made in the case of range cattle assuming that a fair cut of 10 per cent of any breeding herd should give an indication of whether or not there was any infection in the herd. Such a method would not meet the requirements in this case, and there can be no doubt that the expense and shrinkage involved in gathering and holding representative herds in the range country, to say nothing of the large herds, would far outweigh any possible benefits which might accrue, either to the owner thereof or as a matter of public interest, especially when in many instances there is absolutely no ground to suppose that any infection exists in such herds. When you consider the number of retests necessary in some instances, as previously shown, it simply is not practical and the situation does not warrant that such stern measures should be applied. Just take for example Case No. 33 referred to before. Despite the cold fact that 22 tests have been applied, the record is not entirely clear yet. Think of applying such a method to a herd of several thousands cows ranging in the rough country. Just how would you go about it?

My own experience is limited to observation of neighbors who have co-operative. In no case have I witnessed lasting beneficial results. An adjoining neighbor, whose cattle have mingled in common with my own much of the time, has co-operative for two years. He has removed many of his productive cows as a result of positive tests to the point where this year his calf crop was very small. This neighbor used
my corrals in making his tests, and I now find some of my own cows, which were tested with his by mistake, tagged and branded as positive reactors. Yet, my 1938 calf crop was the best I remember in 30 years.

A state-owned herd of registered cattle in Wyoming, from which I have bought many bulls, was tested and found to be very badly infected. The herd was nearly ruined through removal of infected animals and work finally discontinued without cleaning up the herd.

That many abortions in infected or untested herds are due to other causes than Bang's disease is an accepted fact. I know that if I leave my cows in a certain pasture after a certain date many will abort. I also know that when removed to another pasture and different water they cease to abort. This may be due to the type of forage, or lack of minerals, at that stage of the gestation period, but in any event, I have learned from sad experience not to leave my cows in that pasture after January 15. Similar facts no doubt account for exaggerated losses attributed to Bang's disease.

The magnitude of the job which would need to be done if the program is pressed in the range country is shown by the following information released by the Department of Agriculture on June 7, 1938:

Percentage of breeding cattle in the western states under official supervision in the Bang's disease project on May 1, 1938, are: Oregon, 75.5; Washington, 70.7; Utah, 48.1; Idaho, 29.9; North Dakota, 20.3; Montana, 19.4; Nevada, 18.9; Oklahoma, 16.9; New Mexico, 10.1; Wyoming, 10; Arizona, 4.6; Kansas, 4.4; Nebraska, 3.8; South Dakota, 2.2; Texas, 1.6; Colorado, .8; California, .04.

The total number of herds under supervision on June 30, 1938, in the United States was 1,035,454, containing 9,447,137 head of she cattle and bulls under Bang's tests. The total number of all cattle reported on January 1, 1938 was 65,930,000, so approximately 14.3 per cent of all the cattle were under Bang's supervision, while in the 17 western states, as shown above, approximately 9.04 per cent were so included, largely in the northwest group of dairy states.

The surface has little more than been scratched in many of the states. One important fact that is commonly overlooked when considering eradicating Bang's disease in bovine herds is that there are various other sources of infection, so that even though it were possible completely to eradicate the disease in any given area—and the record is not too convincing on this point to date—there would still remain the danger of reinfection from sources about which very little if anything is being done at the present time. In corroborating-
tion of this statement, the following is taken from a booklet on calfhood vaccination by Dr. H. E. Curry, state veterinarian of Missouri:

“Another weakness of this plan that cannot be overlooked is the fact that other animals on the farm, aside from cattle, are capable of harboring and spreading the infection of Bang's disease. For example, horses, hogs, poultry, and dogs may carry the infection, and any program that fails to take cognizance of these facts and attempts to eradicate Bang's disease by the blood testing and slaughter method is destined to failure.”

In December, 1935, and January, 1936, 500 surplus elk from the herd in the Jackson Hole country of Wyoming were slaughtered and sold to a concern in Minnesota. The people receiving the elk would not accept them without meat inspection. Therefore, an official of the Live Stock Sanitary Board of the State of Wyoming called upon to administer this service. One hundred and forty-nine blood samples were collected and submitted to the bacteriological laboratory at the University of Wyoming with the request that they be tested for infectious abortion. Twenty-nine of these samples were positive and 15 of the samples were suspicious to the agglutination test.

Under natural conditions animals in many herds have acquired a considerable degree of resistance to the disease. When all known reactors are removed, this immunity is lost, and although the herd is supposedly 100 per cent clean, it is likewise 100 per cent susceptible and the risks incident to breaks are very much increased.

It is quite obvious, even to a layman, that much more should be known, and some more workable method perfected before the compulsory eradication of Bang's disease should be applied to the live stock industry. Present methods require innumerable and frequent tests to a point where compliance is impossible with cattle handled under range or semirange conditions. It is gratifying to note increased experimentation and satisfactory results obtained from calfhood vaccination.

Again quoting Dr. H. E. Curry:

"Calfhood Vaccination. This plan promises to be the most feasible and economical procedure in the control of Bang's disease. Vaccination as a means of controlling Bang's disease has been successfully employed by members of the veterinary profession in field operations for some time, and many breeders realize and appreciate the value of veterinary service in connection with a plan of this sort. Much experimental work is being carried on at the present time, in order to conclusively prove that with the use of a specially prepared vaccine, calves between the ages of four and eight months may be successfully immunized against the infection of Bang's disease.
and that it will be possible for the average farmer and dairymen to raise, under this method, a herd that is immune to the disease, that will resist infection from animals that may be brought into the herd, or infection which they may come in contact with from adjoining farms.

"The vaccination plan is a constructive measure. It may require a little more time to establish a clean herd this way, but the breeder is not forced to dispose of his producing cows or wipe out certain blood lines by consigning cattle to slaughter that react to the test; therefore, it is possible for the breeder to carry on his operations and gradually build and maintain a herd of cattle that will be free from the ravages of Bang's disease. For that reason, the experimental work now in progress should be encouraged and supported by the livestock industry as a means of protecting that industry from one of the greatest economic problems, from a disease standpoint, that confronts it today."

A practical experience in vaccination is reported by Dr. R. M. Gow, state veterinarian of Colorado, in an article published October 25, 1938, in "Western Live Stock," as follows:

"A North Park, Colorado, breeder reports that he vaccinated 136 heifer yearlings on April 1 and turned them in the Forest Preserve. On July 1 the bulls were turned into the herd. When the agglutination test was given several months later, 50 per cent of the heifers reacted, although they all calved satisfactorily in April and May.

"These heifers are running with older cattle, part of them infected with Bang's disease, making a total of 201 head. Out of this bunch, 190 calves were branded in the fall of the year. The 136 heifers have now calved for the second time."

These are but a few of the records available, all showing favorable results from calf vaccination. It is high time that more attention be given this very important phase of the problem.

One of the crying needs for the benefit of the livestock industry as a whole—and this applies to the beef cattle industry as well as to the breeders of purebred beef and dairy stock—is sensible regulations covering the interstate movement of such stock. A chaotic condition has been created by the growing roster of state rules and regulations until it has reached a point where a shipment can hardly be made except for immediate slaughter without ascertaining the last minute rules and regulations of the state to which the shipment is destined. There have been times that it would appear almost as though some of the restrictions were in the nature of actual tariff barriers prohibiting the entry of live stock from one state because of the competition it would create with live stock produced within another state. There have been other instances where burdensome sanitary restrictions have been placed even though it is well known that the disease at issue is just as prevalent, if not more so, in the state which issues the restrictions than it is in many of the sur-
rounding states. For instance, one eastern state refused to admit cattle, even from accredited Bang's disease herds unless they have been tested within 30 days—a practical admission of the unreliability of the test.

After all, should we not get back to the basis of handling the protection of the live stock industry against disease largely as a national problem, leaving the Bureau of Animal Industry, with the aid of the state sanitary authorities, to cope with all diseases important enough or wide-spread enough to justify national action? That was one of the major purposes, if not the major purpose, for which the Bureau of Animal Industry was created. In a book written by Dr. Hauck in 1924, setting forth the history of the Bureau of Animal Industry at the completion of 40 years of service, this sentence appears in the opening paragraph of the introduction written by Dr. Mohler:

"The first work was almost entirely that of controlling and eradicating animal diseases."

Such an argument may seem inconsistent because of our complaint of the activities of the B. A. I. fieldmen, yet that is a situation which can be corrected, and the issue is a broad one which demands national attention.

One thing is definite: If state and federal appropriations for Bang's disease control are to continue, unopposed, there should be full knowledge of the existing situation, the results obtained, and a limitation of activity along sound and practical lines.

After all, there are our range herds, which are our livelihood and naturally we place the economic results as paramount.

In conclusion I would say:

1. It is apparent that Bang's disease causes the greatest damage in herds such as dairy herds and some purebred herds which are more or less closely confined to limited quarters.

2. The present testing program was originated to meet that situation.

3. Natural conditions in the range or semi-range country and the method of eliminating barren cows are not conducive to the maintenance of the disease.

4. Therefore, the present program, originally designed to meet a different condition, is largely inapplicable and impractical in range and semi-range country.

5. The economic burden of depleting herds and of sacrificing animals which are best producers and of best blood lines is entirely unjustified.
6. In view of the fact that the present agglutination test has been in use for over a quarter of a century and still shows very erratic results, it seems only sensible to urge greater concentration on the development and use of vaccine in building up herds resistant to the disease.

7. Therefore, education as to the use of the vaccine and not prohibition against its use should be the order.

8. Little need be said about the matter from the standpoint of public health. The pasteurization of milk can be extended adequately to meet the situation—at any rate, it is not a problem as relating to beef.

9. In line with the policy suggested above, all area work or pressure for a compulsory program in the range country should be immediately discontinued. In place thereof, build up immunity as rapidly as possible through calf vaccination, which is proving more beneficial and far less expensive than the present slaughter method which is destroying thousands of valuable breeding animals.

PRESIDENT WESTMORLAND: Thank you, Mr. Brock, for this interesting paper. It is now open for discussion.

DISCUSSION

DR. C. U. DUCWORTH (Sacramento, Calif.): Mr. Brock's paper was an interesting one and an extremely enlightening one—at least it was to me. He has apparently made a very comprehensive study of the subject, and speaks with a firm conviction. He pointed out that three or four years ago Bang's disease work started with quite a "bang." There was a fire some place, and we hitched up the fire wagon, and away we went.

Now, from the remarks that Mr. Brock makes here it is assumed, lestwise, that some of the livestock producers in the country sort of felt that "the fire is out, and I wonder what the haste is all about?" Maybe we had better slow down into low gear, go along a little more smoothly, probably, rather than at a higher rate of speed over what is apparently developing into a rough road.

Mention has been made of variations given by different laboratories on blood test work. I have here in my pocket a report of the Eastern States Conference of Laboratory Workers of the Bureau of Animal Industry, of the State of Pennsylvania, held in Pennsylvania on September 6, 7 and 8, in which it says that "the secretaries and commissioners of agriculture at their meeting in Rhode Island discussed some differences of results obtained in different states when duplicate samples of blood serum were tested for Bang's disease. It was suggested that representative laboratory workers get together in conference to consider these differences."

It seems to me a rather sad state of affairs when our directors and secretaries have to call our attention to do a job that we should see and do ourselves. I think that is the indictment of our own willingness to try to get together.
It states further: "The results obtained at this conference seem to indicate definitely that working under identical conditions, and using identical materials, there was a very high percentage of agreement by different persons in determining the results of the tests."

It goes on further and says: "On the other hand, a comparatively high percentage of disagreement was demonstrated when materials used were not identical."

Last year this Association recognized the fact that at least our antigens were not the same, and went on record favoring the government standardizing antigen. We took no action as to standardization of technique, equipment and personnel, and with such I think we can fairly assume that we might have as many variations of the agglutination tests as suited the whims and fancies of those doing the work.

Out in California we have some pretty hot territories. You know, we are changing our policy a little bit about California. Instead of telling you how good it is we keep still, because so many of you fellows came out there and we nearly had to pay you $30.00 a week. (Laughter). But we have territories out there in which, if you were using a rapid method out in the field, your results would not be comparable with those conducted under different atmospheric conditions. I don't know if that has anything to do with the sun spot program we listened to this morning, but results we do know are different.

And the industry says, in substance, "If they are different they both can't be accurate." They are very seriously questioning that. They have a right to question that. They ask me questions—I am speaking only of the part of the country from which I come, and I appreciate that many of you have conditions that are entirely different to what I run into—and they don't use the nice language that Mr. Brock used! They use the sort of language and blow it up like a firecracker.

I have had this asked me: "How come you fellows got busy and fixed up a serum and virus, and whatever you need to use, to protect hogs from hog cholera? Hogs were dying so that you made a product to protect them. When you recognized the seriousness of anthrax you made a vaccine to protect them. Now you come along with a condition that won't kill cows, and you say, 'By golly, we will!'"

It is really difficult for them to understand, and I can appreciate their position. They ask the question that Mr. Brock brought up as to other host animals, and what assurance they have that they are not going to be re-infected by known or unknown host animals. I cannot give them an answer to that.

We must realize that we are working under appropriations making our work possible, and those appropriations are largely sponsored and gotten for us by livestock interests. If we get ourselves too far divorced from the industry, and can't give them the answers to the questions they want, they might not be quite so interested in getting the dough to do the job.

I appreciate the working conditions of some of you men. You say that the industry in your part of the country is clamoring for this work to be done. In that event, in my opinion, it is the job of the regulatory man to endeavor to carry out the wishes of the industry there.

We had a meeting in California the first part of the year, with representative livestock people from various parts of the state, and the Chairman at that time called on the various livestock owners
DISCUSSION, BANG'S DISEASE

before he called on any of the regulatory or university men. The only man who said he would like to get some indemnity and have his reactors removed was one beef man. The other beef men present were against it, and the dairy men present were against it.

I think we need a great program of education. It has been mentioned here this year—and it was mentioned last year—that owner cooperation is necessary. The owner is not going to cooperate until we can answer his questions for him. We must educate him, because herd management is such a big factor in controlling this condition, whether you are going to do it by test and slaughter or whether you are going to do it by immunization.

It appears to me that the universities have a job. They are the people who teach folks how to do things. Education must be taken to these people, and when they become educated to the proper point they will then look more kindly upon regulatory measures, and our work will become easier. We can hope for success if that is done, but with the attitude of the livestock people, leastwise in my part of the country, we could not possibly hope for success, because we are putting regulation ahead of education. (Applause.)

DR. FOSTER (Oregon): Beef cattle in Oregon are 98 per cent tested in a town, leaving less than one-half of one per cent not tested, and they are now clamoring for accreditation, and such would be granted in the Bureau had such a schedule in effect. They have two other strictly beef counties in Oregon that are about 65 to 75 per cent tested, and we are swamped now with applications. I dare say that in another year we will have those counties also 98 per cent tested. Lake County, Oregon, is another strictly beef county, and now has an application in to test about 20,000 cattle. (Applause.)


Gentlemen:

I would like to say just a few words concerning this problem. I believe that the present Bang's disease program has done a good deal of good, and I would like to see it continued until it has been given a fair trial. I know that as a result of the program a great many infected herds have been freed from the disease and have remained free. I also know that all reactors have been removed from some herds only at what seems to me a prohibitive cost, and that there are other herds from which all reactors had been removed that became reinfected.

As I see it, the proposition is this: Can we eradicate Bang's disease, economically by the test and slaughter method? I have no doubt but that the malady can be eradicated from any herd if expense is not taken into consideration, but in some herds there might not be many animals left after the last reactor had been removed.

The Bang's disease program is a good one and deserves a thorough trial. There are some dangers connected with it, however, that seem to deserve consideration. I think that the principal one of these concerns replacements. It is necessary in most herds that the reacting animals that are removed be replaced by others and great care should be exercised to prevent bringing in, not only Bang's disease, but some other maladies not present in the herd, which at the time, may not be recognized as of much importance, but which in years to come, may
greatly increased the last few years. The same may happen to other diseases which as yet are of minor importance. There are reasons to become a serious affection. As an example, encephalomyelitis has believe that Johne’s disease which is often so difficult to detect in its early stages, may become much more widespread than at present, and unless care is exercised, may be spread through replacements.

Moreover, it seems to me that if an owner who has just removed his last Bang’s disease reactor and has cleaned and disinfected his premises as best he can, should buy replacements from negative herds that have always been negative, and never exposed to infection; that he may be bringing tinder to smouldering coals, in the form of residual infection remaining on the place, that may set up an outbreak of disease. We cannot hope to destroy every Bang’s disease germ on an infected premises, even by a careful cleaning up and disinfection, some infection is likely to remain in some out of the out way place. Fresh animals coming in with no resistance or with less resistance than those that have been raised or kept in the infected herd for a long time, are of course more likely to become infected. This is one of the problems that confronts the owner of infected herds. This and the possible danger of bringing some other than Bang’s disease into the herd is something that should be kept in mind. We should look not only to next year or the following one, but also ten, twenty or more years hence, in deciding what is best for the industry.

Dr. Van Es, who I believe is one of the greatest if not the greatest livestock sanitarians in the country has said in effect in connection with disease control that too many animals move in the wrong direction in this country and that the ideal way is for them to move from the farm to the slaughter house and seldom from farm to farm. I have a good deal of respect for this opinion and it would seem that a program that necessitates the movement of large numbers of animals within a short space of time from farm to farm, especially if they pass through sales yards, is not without some danger and that efforts should be made to reduce the risk to a minimum.

Regarding area work, I want to say that though I believe in the Bang’s disease program, I do not think that participation in it should be compulsory, at least not yet. I think that it should be left to the cattle owner to decide whether he wants to participate in the program or not, for it does not seem to me to be right to force him into something that may possibly cripple him financially or put him out of business.

As to the agglutination test, I don’t believe that we need to worry about it very much more. It is a good test but lacks quite a bit of being perfect. However, no biological test is entirely without shortcomings. The Bang’s disease test is much more nearly faultless than it was a few years ago. I believe that machinery is in operation that will make it as nearly perfect as it can be made and think that the men working on the problem are fully capable to handle it.

I wanted to say these few words to give you some of the things which my own experience has led me to believe.

I thank you. (Applause.)

DR. R. M. GOW (Colorado): I have noticed that some of the Veterinarians smiled when it was reported about calf-hood vaccination results. If you will go over to the Stock Show, the Grand Champion
load of Angus steers are from a herd where calf-hood vaccination had been practiced for the past three years. The third prize Shorthorn cattle were Colorado cattle, fed in the middle-west. They are out of a herd where there is Bang's infection. They practiced calf-hood vaccination. We vaccinated 61 heifers a year ago and they have all calved this summer and these calves will be at the Stock Show next year as fat steers.

Regarding this Shorthorn herd, we are in business out in Colorado to produce beef and you must have calves to produce beef. During the last thirteen years this same Shorthorn herd of cattle won ten first prizes in the fat steer class in their own breed and one Grand Champion. In another Colorado herd that the steer calves were sold to different feeders and shown this year at the Stock Show in the Hereford division, they won first, second and third prizes. And the only drawback is that you men don't take it seriously, the calf-hood vaccination plan. I have missed this Association meeting only three times in 25 years. We started it originally for the purpose of controlling contagious and infectious diseases. Now we have come to the point where the only way we think we can control a contagious and infectious disease is by the slaughter method. Naturally, a breeder can get rid of any disease if he slaughters the cattle off. We can handle cattle in the West. We can blood test them, but the slaughter method is not economical. And if we decided to do so, we can move Pikes Peak down to Texas as a WPA project, it would be successful, but not economical.

DR. COTTON: I forgot to say something I intended about calf-hood vaccination. I cannot agree with Professor Rettger with regard to it being incompatible with the test and slaughter method. I do not see why it could not be used to advantage in connection with such a method. If the vaccination is successful, the animals should either cease to react or react in titers too low to mean infection within a year, and any ones giving real reaction after that time could be regarded as infected and treated accordingly. Bang's disease is so formidable an enemy that we need to use all means of fighting it that are available. Anything that has been proved to be safe and worthwhile should be used.

DR. WILLIAM H. LYTLE (Oregon): In Oregon, we recognize that the testing of range cattle for Bang's disease is a controversial question, however, from the economic standpoint of livestock sanitation it pays. It may be purely a matter of opinion somewhat like the worker who visited his doctor who when questioned as to what he ate and drank, stated, among other things, I drank eighteen cups of coffee. His doctor upon asking if that didn't keep him awake, answered "Well, it helps."

In Oregon we sometime ago had the greatest number of Bang's reactor cattle in any single herd tested in the United States. These reactors numbered more than 400 head and yet the owner was satisfied for he increased his calf crop from his cleaned range herd of 2000 females 15%, so it helps.

DR. R. A. HENDERSHOT (New Jersey): Regarding Dr. Duckworth's remarks on the conference held in September at Harrisburg, I don't know where he got his report. It so happens that I served as Chairman of the Committee at this meeting, and as yet I have no written report.

It is true we met in Harrisburg at the instigation of the Commis-
sioner of Agriculture of Rhode Island, but as Doctor Rettger pointed out in his talk earlier in the day, it is of paramount importance that trained men be employed to conduct the laboratory work in connection with Bang's disease control.

The meeting was called because of the fact that there was a man employed in a laboratory who was apparently not acquainted with the literature and the work being conducted in Bang's disease elsewhere. He was aroused and alarmed about some check tests that had been conducted in his area that were in disagreement with his own test results. As a consequence, the meeting of laboratory workers in the eastern half of the United States took place in Harrisburg. Among other things brought out at this conference was the fact that readings of twenty individuals from fourteen different states proved to be practically in unanimous agreement when the tests read had been set up with one antigen. There was, however, some discrepancy when antigens prepared in the various states were employed. The greatest difference revealed at this conference took place when the density of test fluids brought to the meeting by individual members was judged.

It was the consensus of opinion of those in attendance at this meeting that uniformity of reading was largely governed by the use of uniform antigen. They, therefore, passed a resolution asking that the Federal Government produce Bang's antigen and supply it to all state laboratories conducting tests.

DR. DUCKWORTH: I will have to supply my good friend Hendersott with that information. I got the report from my own Director of Agriculture, but where he got it I do not know.

PRESIDENT WESTMORLAND: Is there any further discussion? If not, we will proceed with the next paper.

"The Progress of Area Work in Bang's Disease Control in Arkansas," by Dr. C. D. Stubbs, State Veterinarian, Little Rock, Arkansas. (Applause.)

... Dr. Stubbs read his prepared paper.

**AREA WORK ON BANG'S DISEASE IN ARKANSAS**

*By C. D. STUBBS, Little Rock, Arkansas*

*State Veterinarian and Secretary, Arkansas Live Stock Sanitary Board*

The progress that may be made in any state in the eradication of Bang's disease is proportionate to the adequacy of the laws on the subject in that state. In Arkansas we still have in force the old tick eradication law which has plenty of teeth in it. We have not accomplished a great deal in our state by voluntary testing. We have cleaned very few herds that have remained clean. On the other hand with compulsory area testing we have already tested all of the cattle in 40 counties and have many other counties well on the way to being clean.

Area work has every advantage over herd testing. It eliminates exposure by contact, accidental or otherwise. We have
never had any difficulty in cleaning herds in area work. In herd testing we have had reactors in as many as eleven consecutive tests. On the initial test we put enough men in a county to test all of the cattle in a period of four weeks. Then all but one or two of the men are moved to another county. Those left retest the herds in which reactors are found every thirty days until all herds are clean.

The amount of infection in Arkansas varies from 1.8% in the range counties to 24.4% in the Little Rock milk shed. The infection in the latter has already been reduced to less than 2%.

Arkansas as a cattle exporting state and area work has been a great advantage to the livestock owners. Cattle buyers tell me they prefer cattle from area tested counties because such cattle seldom ever react upon retest at destination while a great percentage of cattle bought from tested herds in untested counties react upon a 30-60 day retest.

The chief infection in our state is in border counties where the disease was brought in from adjoining states and in counties like Little Rock where there is much exchange and importing of cattle. In the range counties where the only or chief movement of cattle is out to other counties there is surprising little infection. In one county having 12,000 cattle infection was found in only five small herds on the initial test.

Regardless of how hard the owner and veterinarian tries they can never hope to clean up an infected herd by the blood test alone, or vaccination alone or any other method. Equally as much stress must be laid on sanitary measures. We have found it almost impossible to clean a herd in badly infected premises provided the cattle are permitted to bed around old straw sheds or old straw stacks. Many cows seek such places to calve and many abortions occur there. Such areas are highly infectious.

We operate under a law that gives range riders authority to seize and drive away the animals of any owner that objects to the test. The owner must then pay for having the test made; must pay for the feed and care of the cattle while being tested and pay three dollars a head to the range rider for seizing them. If he refuses to pay and take back his tested cattle the range rider can sell them, pay all the charges and remit to the owner what is left. To be sure we have the law enforcement organization behind us. Before we begin testing in a county we contact the sheriff, the prosecuting attorney, the county judge and at least two justices of the
peace, therefore, we have had very few objections in any county and in several counties none at all.

As before stated we have counties in our state that showed as high as 24.4% infection. It was a question, at the time, whether calfhood vaccination in that high percentage would not have been indicated. After discussing the problem with stockmen in that district, it was decided to continue with the slaughter method. I am now well satisfied with the results obtained. Practically all of the cattle were re-tested and again re-tested, until now the infection has been lowered to a little over 2 per cent.

I am in accord with area testing in eradicating Bang's disease in cattle. I can see no objection to area testing in states under the same conditions that we have. I do not believe that we as sanitary officials should permit one owner to test and endeavor to clean his herd while his neighbor refuses to test, and permits his cattle to occupy a pasture separated only by a wire fence.

I thank you. (Applause.)

PRESIDENT WESTMORLAND: Thank you, Dr. Stubbs. The subject is now open for discussion.

DISCUSSION

DR. JAMES S. HEALY (Wisconsin): I sat here, and after Mr. Brock sat down I felt very uncomfortable, thinking that I did not discuss his paper to some extent at least, and especially so when sitting at my side was my good friend Mr. Glover, who kept nudging me and saying, "Get up; get up!" Well, I did not want to get up.

His problem is so dis-similar to anything that I had information on, or a direct contact with, that I could not appreciate his picture. I want to compliment him upon the very excellent paper that he gave us, having in mind of course what he was talking on, and the objective he had in mind.

It covers the subject admirably, and we should also thank him for the excellent discussion that followed, having heard from our old friend and colleague, Dr. Cotton, also other remarks that were made. In connection with Dr. Stubbs' dissertation on area work he brought out many excellent points, in a way, which are elementary but nevertheless very germain to the subject.

I would hesitate, in Wisconsin, to try out area work under the plan as is done in Arkansas and some other states, so I am going to beg your indulgence for just a moment to tell you our experience with area work.

In the control of any disease, tuberculosis, Bang's disease as well, area work follows as the night the day, and it is not stimulated by federal or state officials—it springs spontaneously from the minds of the breeders who wish protection.

As soon as we started voluntary work, and feeders began to sign up, we heard this remark orally and also read it in letters to us from
every hand: “Well, when are you going to do area work? When are you going to start on area work? That is the only way to control this disease. I will test when my neighbors test.”

But, as Dr. Wight said in his report today, he thought it advisable to have a high majority of the people when you intend to do Bang's disease area work. From our experience in Wisconsin I would say “Amen” to that, and therefore our law in Wisconsin, I think, is democratic. It is based on obtaining at first hand, the signature of 75 per cent of the actual bona fide cattle owners in an area, to a petition requesting the test of all the cattle in the area. The county is the area in Wisconsin. It works out better—results in better cooperation.

The other 25 per cent are entitled to a hearing. A hearing is held to determine the sufficiency of that petition from a legal standpoint, and if it is found to be all right we can proceed with the work and publication is given that the work will start on a certain date. We are having people test for Bang's disease in Wisconsin today on decreased indemnities. They are not getting what they did. Still all we can do is keep up with the work. We could use additional men, as we know, if we had the added incentive of having the state contribute with the indemnity, then we would go ahead with the work like nobody's business.

I want to thank Mr. Brock for enlightening me. Honestly, I thought and bragged that Wisconsin was responsible for obtaining that emergency money for the elimination of diseased cattle from our herds. Maybe I got that idea because our Senior Senator, La Follette, introduced the resolution, or whatever you may call it, which provided the necessary funds.

But I do know, gentlemen, and I see a number of our dairy men from Wisconsin in the audience, that after we were working on tuberculosis eradication for about two years, under the accredited herd plan, any number of people from the heavy dairy section of Wisconsin came to the office and said, “Doctor, we are getting along fine on tuberculosis, but we want to know when you are going to do something for us on contagious abortion.” I tried to smile and say, “I don't know,” because we had a fairly good idea as to the percentage of infection in our state, in our cattle population, and with just a short lead pencil we could have readily determined the cost of what it would be.

I doubted if our legislature would provide the necessary funds, and whether congress would give us an “in.” But here came a time when the disease kept on progressing, causing the additional economic loss which the dairy man may recognize more keenly. As I understand it, the dairy program which had been advanced by the AAA, was not acceptable to the dairymen of the mid-west. The dairy interests became alert to the fact that there was a possibility that we could get some aid in controlling or eradicating Bang's disease, which was one of their economic hazards. They presented their case to Senator La Follette, and $50,000,000 was set aside.

Naturally I assume that many arguments were used in obtaining this emergency money, such as were used by Mr. Brock today, in substantiating the remarks that he made that this program had its origin as a dairy reduction program. It never worked as a dairy reduction program in Wisconsin. We had the “out and out” cattle reduction program, but it didn't fulfill its purpose, as we got the old cows from one end of the herd and the young non-producing cows from the other end and the milk production remained the same. We couldn't use Bang's as a dairy reduction scheme, because it does not pick out
the ones the man wants to send to market to be slaughtered unfortunately, but we used it from the very beginning, as a disease control measure.

Some people in the very beginning in 1934, when prices were low for livestock and feed was scarce, may have used it as individuals to reduce their herds; but it has not been a cattle-reduction program in Wisconsin. It is not one now, and we are having a great deal of success with it, and especially in the area.

I thank the audience for its attention and for giving me this privilege to speak. (Applause.)

DR. HADLEIGH MARSH (Montana): For the benefit of Mr. Brock and the other western cattle men who are in the audience today, I thought it might not be amiss for a representative of the veterinary department of one of the range states to say just a word.

We have already heard Dr. Gow and other men speak, but along a little different line. In Montana we believe it is worth while to test some of our range cattle. I think in the case of strictly range cattle, when there is no winter feeding, that very likely Bang's disease need not be a very serious problem. But in most of our western states the majority of the cattle are fed in the wintertime to a certain extent, more or less. And we believe that to be the time when the infection spreads, and occasionally causes very serious trouble in what is commonly known as a range herd.

While we are not in favor of compulsory testing of any of our range cattle, we believe it is worth while to cut out the reactors in the herds, and the principle that we are working on at the present time is just this: We believe that properly handled beef herds should have a short breeding season, and the bulls should be in for as short a time as practicable, which gives one a chance to clean up his herd, a chance he wouldn't have if the bulls were with the cows the year round.

If the breeding season is short we believe that with an annual fall test we can keep Bang's disease at a minimum, and probably eliminate it. In combination with that annual fall test we are trying out vaccination on quite a large scale. It looks as if the calfhood vaccination should give us some results. We do not believe it does any harm, so we are trying it. But we do not believe in doing that to the exclusion of the blood testing of these herds, although with most of our range cattle the program that is carried out with dairy cattle, with frequent tests and cleaning up on that basis, is quite impractical. (Applause.)

DR. MARVIN R. HALES (Washington): I am very much in accord with the program carried on in Arkansas. It is almost identical with our program in the State of Washington. However, we came into the area testing work just a little differently than they did in Arkansas.

Some two years ago objections arose among some of the dairymen throughout the state that the Department of Agriculture was planning a compulsory program. They immediately took steps to arrange with the Department of Agriculture to hold a meeting and discuss the possibilities of whether or not the area program was the one to undertake. The request was granted, and representative owners in the state who objected to the Bang's test were present at the meeting.

They went to the meeting with a chip on their shoulders, trying to put the Director of Agriculture "on the spot" with regard to the program, and they immediately started questioning him as to what our program was. There was a small blackboard on the platform,
and he wrote across the top of it, "The Program Adopted by This Meeting Will Be the Program Carried Out Throughout the State by the Department of Agriculture."

That was dumping the problem back into the lap of the people who had objected to the test. They wrestled with the problem all day long, and later they came in to the Director with a program of compulsory area testing. They formulated the necessary regulations to carry out that program, and we felt that inasmuch as those who had objected had agreed to area testing, that we would have no difficulty with the rest of the livestock owners in our state, and I think we have found this to be true, so far in our program.

We have only some 150,000 odd range cattle in our state, over 50 per cent of those having been tested on the optional test before we ever considered the area test. We have some few herds that run up to 3,000 head. I recall one herd in particular that we started testing 18 months ago, at that time there was 10 or 12 per cent infection, and a complete herd test a few weeks ago revealed only one suspect. We do not eradicate Bang's disease if we retest infected herds only once every six or eight months.

I believe Dr. Givens, of Virginia, hit it two years ago when he said we have to prosecute this program vigorously and earnestly and follow it up. It is seldom that we have more than three herds in any of the counties in which we experience difficulty in obtaining a clean test after about four retests of those herds. Our problems, we think, are small if we give those herds the necessary retesting and instruct the owners regarding the proper sanitation on their premises. (Applause.)

PRESIDENT WESTMORLAND: Is there any further discussion on this paper? If not, we will proceed with the program.

We will now have the report of the Committee on Bang's Disease, by Dr. C. P. Fitch, Chairman. (Applause.)

. . . Dr. Fitch read the report of the Committee on Bang's Disease.

REPORT OF THE COMMITTEE ON BANG'S DISEASE

DR. C. P. FITCH. Chairman, St. Paul, Minn.

Dr. A. E. Wight, Washington, D. C.
Dr. Edwin R. Dimock, Hartford, Conn.
Dr. H. C. Givens, Richmond, Va.
Dr. Cecil Elder, Columbia, Mo.
Dr. T. O. Brandenburg, Bismarck, N. Dak.
Dr. R. W. Smith, Concord, N. H.

We have endeavored to arrange a program that would present the most important phases of Bang's disease control. We believe this has been accomplished. It now remains for this report to give very briefly recommendations for your consideration.

Progress during the past year in Bang's disease control has been satisfactory. The application of the agglutination test and the removal of infected animals as a means of Bang's disease control has passed beyond the experimental stage. Area work, as you have already noted, is extending, and we are embarked on a definite program of Bang's disease elimination.

Legislation enacted by the last Congress gives definite indication of the prevailing sentiment for the control of Bang's disease. Under the provisions of the Federal law, made effective July 1, 1938, it is required that beginning May 1, 1939, the state or the cooperating
agency must make payments to owners for cattle that react to the test if any Federal payment is to be made to them. The law states that the amount paid by the Federal government shall not exceed the amount paid by the cooperating agency and shall not be more than one-third of the difference between the appraised value and the salvage. Arrangements have been made for the owners to receive a state payment in only fourteen of the forty-eight states. Therefore, it is most important for action to be taken to bring about the necessary laws, regulations, and appropriations to cover state indemnity if the work is to proceed. It is also significant that the appropriation was made directly to the Federal Bureau of Animal Industry. It is now distinctly a departmental activity.

The Bureau of Animal Industry has continued its work in connection with the testing of official Bang's disease antigens used in the official Bang's disease program. Much improvement has been made in the production of satisfactory antigen, both tube and plate, for the Bang's disease work. The Bureau is also giving careful consideration to producing the antigen which will be used in this work. Your Committee desires to recommend that the Bureau continue its efforts in this direction. We sincerely hope and trust that it will be possible for the antigen used in official work to be produced by the Federal Bureau of Animal Industry in a manner similar to that which has been so successful for many years in the production of tuberculin used in official work.

Last year your Committee commended the regulatory officials of the northeastern states, who through cooperative means adopted rules and regulations which would be used as a basis for interstate and intrastate traffic of cattle as related to Bang's disease. We hoped that other groups of states having common problems would hold similar conferences, discussing uniform rules and regulations. We are sorry to say that such conferences have not been generally held. We are still faced with a multiplicity of rules and regulations, with special reference to the interstate traffic of cattle. We clearly recognize that different states have different problems, but we also are duly cognizant that all interested in the live stock industry should appreciate the importance of Bang's disease and the necessity of its elimination. We believe that much of this confusion would be eliminated if group meetings were held and full discussions took place.

The conference held in St. Paul in March, 1938, under the auspices of the Minnesota Live Stock Breeders' Association and the Wisconsin Live Stock Breeders' Association was productive of a great deal of good. We believe that the report of the Committee on Recommendations of this conference, which was unanimously adopted, was far-reaching and deserves the attention of all those interested in Bang's disease control. Again we recommend that other groups of states having common problems join in discussing and adopting uniform rules and regulations. The Federal Bureau of Animal Industry should continue to study the situation, working toward the adoption of national regulations.

Your Committee wishes to heartily endorse the action taken by the Federal Bureau of Animal Industry in having labels placed on commercial vaccines for Bang's disease prepared to show that this material is to be used only on calves and that the dose is 5 c.c.

The experimental work being conducted with a strain of Brucella organisms of reduced virulence should be continued both at experi-
REPORT OF THE SPECIAL COMMITTEE ON PUBLIC RELATIONS

DR. J. L. AXBY, Chairman, Indianapolis, Ind.

Dr. E. T. Faulder, Albany, N. Y. Dr. E. A. Crossman, Boston, Mass.
Prof. H. R. Smith, Chicago, Ill. Mr. Chas. L. Hill, Rosendale, Wis.

MR. PRESIDENT:

Your committee recognizes that any and all recommendations it may make, must never be drastic, but always reasonable and justifiable.

It also is cognizant that in the warp and woof of our complex civilization individualism is ever asserting itself in total disregard of aggregate Sanitary Science and all other purposes of the United States Live Stock Association as set out in Section 2 of the Constitution of the Association.

Ignorance was accountable for witchcraft, and ignorance is today accountable for the purchase of nostrums, and the establishment and maintenance of policies of sale of biologics and pharmaceuticals which are detrimental and often devastating to respective herds, droves and flocks.
Auction markets have developed in large numbers during the past several years, and said markets being un-supervised relative to disease control, trucks and improved highways causing a disregard for state lines, calls for stringent regulations of all auction markets not under federal supervision.

Agriculture is the basic industry of the land, and the live stock industry is the keystone of the arch of agriculture. Only healthy live stock produce wholesome food and quality by-products.

Only applied live stock sanitary science begets healthy live stock and wholesome food. These facts should be continuously advertised.

The United States Live Stock Sanitary Association has a great responsibility, and a glorious opportunity, because the live stock breeders and dairymen of North America look to it for the latest information on disease control and for recommendations to the various subdivisions for safe and sane regulations to prevent the spread of disease.

We should not stop upon making the recommendations, but devise ways and means to meet the expectations of those we serve.

The leadership in live stock sanitation is purely a veterinary duty, and this Association and every member of it should take advantage of every opportunity to educate the public and give credit where credit is due.

In view of the above generalities your committee makes the following recommendations:

1. Release to the public of the latest information on disease control.
2. (a) Educational campaign against the purchase of nostrums.
   (b) Educational campaign against the purchase and administration of biologics except to and by those qualified to administer such.
3. The adoption of more uniform state regulations.
4. Stringent inspection regulations of auction markets, not under federal supervision.
5. Encouragement of a closer working union with the American Veterinary Medical Association, the American Medical Association and state medical associations, farm papers and the spread of live stock sanitary information by every worthwhile means.
6. We recommend and encourage publicity of leaders and scientists, and their work, whether they be veterinary, medical or laymen, in every station and position, that credit may be given where credit is due, that the purpose of this Association may be fulfilled, and that every person, firm or corporation may the better know of our close relation to their progress, welfare, happiness and health; not for live stock alone, but for man as well; that every boy, every girl and every convalescent may be assured "A bottle of milk is a bottle of pure balanced growth, health and vigor."

Information of this kind widely disseminated will be broadcast upon the turbulent waters of superstition and ignorance, not only quieting turmoil, but assuring a many fold return in reciprocity and public co-operation.

Mr. President, I move this report be referred to the Executive Committee.
PRESIDENT WESTMORLAND: Without further action, this report will be referred to the Executive Committee.

Next on the program will be the report of the Committee on Rabies, by Dr. H. C. Rinehart, Chairman. (Applause.)

DR. H. C. RINEHART (Illinois): Mr. President, and members of the Association, I feel that I am about to give you a report on a very delicate subject, the subject of rabies. I expect you to call it a delicate subject because no one wants to have anything to do with it. In the first place, the veterinary profession would rather leave it alone, as would all the other professions and citizens as well. Therefore, it makes it difficult to handle the situation, and I feel that we regulatory men who have this duty to perform should not have our hands tied.

... Dr. Rinehart read his prepared paper.

REPORT OF THE COMMITTEE ON RABIES

DR. H. C. RINEHART. Chairman, Springfield, Ill.

Dr. H. W. Schoening, Washington, Dr. M. F. Barnes, Harrisburg, Pa. D. C.

This Association is familiar with rabies and better informed on this subject than I. Rabies is a contagious disease, which affects the human family as well as all warm blooded animals with a mortality of 100 per cent. First, I will give you a report of the prevalence of rabies, the method of control, the number of deaths in the human family, in some of the various states, from January 1 to November 1, 1938.

Arkansas, 6; California, 4; Michigan, 4; Missouri, 5; New York, 1; Ohio, 1; Tennessee, 3; Illinois, 4. New Jersey gave me a report that they had several deaths but did not state the number. We have had at least 30 deaths in the human family in the United States in 1938 thus far.

Four states do not mention quarantine; namely, Maine, South Carolina, Kansas and Oklahoma. The balance of the states place quarantines in the case of an outbreak of rabies. Illinois, January 1 to November 1, 1938, 4,576 treatments were sent out from the Health Department. Down state, outside of Cook county, 723 heads examined, 371 of which were positive. In Cook county, 607 heads examined, 207 of which were positive. In the state, a total of 1,330 heads examined, 578 positive.

That rabies can be completely eradicated from a country has been proven in England, Ireland, Denmark, Norway, Sweden, Holland, Australia and Hawaii. England's work towards eradication of rabies through six months' compulsory quarantine of all imported dogs has become almost a classic in medical history. The manner in which officials attempt to control rabies in this country is embarrassing to the veterinary profession. It tends to cheapen the profession and should be handled in a more satisfactory manner. There should be some method of correcting this situation. If the control and eradication of such diseases as foot-and-mouth disease, glanders, Texas fever, anthrax and many other diseases were handled in the same manner as we attempt to control and eradicate rabies, the livestock industry would have been wiped out long ago.
All veterinarians know what quarantine means, but—do we have a quarantine or do we enforce a quarantine in attempting to eradicate rabies? No, we do not. We don't feel there is a single state which enforces a strict quarantine. Why? Because of public sentiment back of the dog, and I am sorry politics is a big hindrance, especially in a local quarantined area. We don't feel it is possible to get local officials in any area to enforce rabies quarantine—at least for any period of time. We don't feel our state officials enjoy the co-operation from any professional body, or any group of citizens or the press, which is necessary for the eradication of rabies. We feel people who own valuable dogs, or any dogs which they desire to keep should have better protection. As a rule, veterinarians who are in small animal practice hesitate and are not willing to cooperate or assist in the eradication of rabies. We shouldn't expect assistance from them because it would possibly cost them business.

Many human lives, thousands of dollars worth of live stock and many valuable dogs lose their lives each year caused by a bite of a rabid dogs. The number of persons required to take the Pasteur treatment because of having been bitten by a rabid dog or otherwise exposed to the disease, is each year becoming greater.

This committee feels there is no excuse for the continued existence of a disease that causes the anxiety, suffering and expense that rabies does when measures for its control and even its complete eradication are known and are comparatively easy to carry out. The ultimate suppression and eradication of rabies in both man and animal, is therefore dependent upon the adoption of measures that will effectively check the disease in dogs. Our eradication campaign must be directed to the dogs. Our slogan is, "You take care of your dog, and I will take care of my dog." If all stray dogs were destroyed, the eradication of rabies will soon be accomplished.

Your committee recommends and feels the control of rabies should be placed in the hands of the federal government, in cooperation with the various states; or, the various states should pass suitable laws and make an appropriation for the purchase of trucks equipped with gas tanks and proper equipment such as guns, etc., to take care of all loose dogs in a quarantined area. Men whose duty it is to enforce this quarantine in a state should be strangers, or at least non-residents of the quarantined area. Such men should be under the direct supervision of the chief veterinarian. All persons engaged in this work should be diplomats and handle their work in a careful, sane manner, but at the same time, get the job done.

Mr. President, I move that this report be referred to the Executive Committee.

PRESIDENT WESTMORLAND: The report will be referred to the Executive Committee. Dr. Rinehart, may we thank you sincerely for your very intelligent and comprehensive report? It is appreciated.

Next we will have the report of the Committee on Revision of Constitution and By-Laws. Secretary Day will read the report.

... Secretary Day read the report of the Committee on Revision of Constitution and By-Laws.
REPORT OF THE COMMITTEE ON REVISION OF CONSTITUTION AND BY-LAWS

Dr. MARK WELSH, Chairman, Baltimore, Md.
Dr. E. A. Crossman, Boston, Mass. Dr. R. M. Gow, Denver, Colo.

Your committee has carefully read the Constitution and By-Laws of the Association and find no basis for making changes at this time. No member of the Association has presented suggested changes for consideration of this committee and we, therefore, recommend that the existing Constitution and By-Laws be continued in force without change.

PRESIDENT WESTMORLAND: I believe it is customary at this time to entertain a motion for the appointment of a Nominating Committee to make recommendations for officers for the ensuing year. Will some one make that motion?

DR. L. M. HURT (California): Mr. President, I move you that a Nominating Committee be appointed to make suitable recommendations for officers for the ensuing year.

DR. I. S. McADORY (Alabama): I second the motion.

. . . The motion was voted upon and carried unanimously. . . .

PRESIDENT WESTMORLAND: The Nominating Committee will consist of Dr. Faulder, Dr. Topmiller and Dr. Curry.

The report of the Committee on Revision of Constitution and By-Laws will be referred to the Executive Committee.

We will now have the report of the Committee on Tick Eradication, by Dr. T. O. Booth, Chairman.

. . . . Dr. T. O. Booth read the report of the Committee on Tick Eradication.

REPORT OF THE COMMITTEE ON TICK ERADICATION

Dr. O. T. BOOTH, Chairman, Fort Worth, Texas.

Dr. Wm. M. MacKellar, Washington, D. C. Dr. J. V. Knapp, Tallahassee, Fla.
Dr. I. S. McAdory, Auburn, Ala.
Dr. W. K. Lewis, Columbia, S. C.

This year's work in eliminating the cattle fever tick has resulted in the release of 10,904 square miles of territory located in Florida and Texas. The area remaining in quarantine amounts to only about two per cent of the original quarantined area and is described in federal quarantine order designated as B. A. I. Order No. 369, which became effective December 1, 1938. In the Territory of Puerto Rico, the western one-third of the island, amounting to 1,243 square miles, was also released from quarantine. The effect of this order is as follows:

In Texas the counties of Jasper, Jefferson, Newton, Orange, Sabine, San Augustino, Trinity and Tyler, the remainder of Chambers, Galveston and Liberty, and parts of Cameron, Hidalgo and Starr, are released from quarantine.

In Florida, part of Orange county is released.

In Puerto Rico, the western one-third of the island is released.
(On May 16, 1938, in Florida, part of Osceola and the remainder of Polk counties were released from quarantine. On August 10, 1938, in Texas, the remainder of Nacogdoches county was released from quarantine.)

The release of territory in Puerto Rico represents the first inroad that has been made by tick eradication on that island. This work was made possible by an allotment of emergency funds made through

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Animal Industry
Washington, D. C.

Progress in Tick Eradication—July 1, 1906 to December 1, 1938.

<table>
<thead>
<tr>
<th>STATE</th>
<th>Counties quarantined on July 1, 1938</th>
<th>Counties quarantined on Dec. 1, 1938</th>
<th>Counties released on Dec. 1, 1938</th>
<th>Area quarantined on July 1, 1938</th>
<th>Area quarantined on Dec. 1, 1938</th>
<th>Area released to Dec. 1, 1938</th>
<th>Area released Dec. 1, 1938</th>
<th>Square miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALABAMA</td>
<td>67</td>
<td>0</td>
<td>67</td>
<td>51,279</td>
<td>0</td>
<td>51,279</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>ARKANSAS</td>
<td>98</td>
<td>0</td>
<td>75</td>
<td>52,583</td>
<td>0</td>
<td>52,583</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>18</td>
<td>0</td>
<td>15</td>
<td>79,224</td>
<td>0</td>
<td>79,224</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>FLORIDA</td>
<td>67</td>
<td>2</td>
<td>41</td>
<td>84,641</td>
<td>4,709</td>
<td>50,135</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>GEORGIA</td>
<td>156</td>
<td>0</td>
<td>158</td>
<td>57,438</td>
<td>0</td>
<td>57,438</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>KENTUCKY</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>364</td>
<td>0</td>
<td>364</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>LOUISIANA</td>
<td>64</td>
<td>0</td>
<td>64</td>
<td>45,409</td>
<td>0</td>
<td>45,409</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>MISSISSIPPI</td>
<td>21</td>
<td>0</td>
<td>21</td>
<td>46,362</td>
<td>0</td>
<td>46,362</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>MICHIGAN</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>1,386</td>
<td>0</td>
<td>1,386</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>N.CAROLINA</td>
<td>73</td>
<td>0</td>
<td>73</td>
<td>57,365</td>
<td>0</td>
<td>57,365</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>OKLAHOMA</td>
<td>41</td>
<td>0</td>
<td>41</td>
<td>47,890</td>
<td>0</td>
<td>47,890</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>S.CAROLINA</td>
<td>46</td>
<td>0</td>
<td>46</td>
<td>30,495</td>
<td>0</td>
<td>30,495</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TENNESSEE</td>
<td>42</td>
<td>0</td>
<td>42</td>
<td>13,218</td>
<td>0</td>
<td>13,218</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TEXAS</td>
<td>193</td>
<td>6</td>
<td>189</td>
<td>151,885</td>
<td>9,779</td>
<td>182,166</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>VIRGINIA</td>
<td>31</td>
<td>0</td>
<td>31</td>
<td>72,565</td>
<td>0</td>
<td>72,565</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>983</td>
<td>8</td>
<td>970</td>
<td>728,565</td>
<td>14,668</td>
<td>743,077</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

Dec. 1, 1938, 8,709 square miles released. (No area requarantined.)
(In Florida, 1,661 square miles released May 16, 1938.
In Texas, 534 square miles released Aug. 10, 1938.
Total area of 10,904 square miles released during calendar year 1938.)
Territory of Puerto Rico, total area............. 3,435 square miles
Area released Dec. 1, 1938 ....................... 1,243 square miles

Area remaining in quarantine .................... 2,192 square miles
the Puerto Rico Reconstruction Administration, and with the completion of the work in the western part of the island systematic work has been undertaken in the middle third.

In its report last year the Tick Eradication Committee mentioned the fact that this project in a few sections of Florida was complicated by deer perpetuating tick infestation and that the work in these areas was temporarily blocked by court action. We are glad to report that these difficulties were ironed out and that satisfactory progress has since been made in reducing the number of deer in the affected areas.

Notwithstanding all the precautionary measures that have been taken to prevent the movement of tick infested animals, a few ticks have apparently slipped by this year, and have started small points of infestation in the free area. Reinfestations of this kind were reported from Arkansas, Louisiana, Texas and Virginia, and in a few cases fever ticks were found in sections long considered tick free. This again emphasizes the fact that as long as any section of the country is tick infested, the danger of this pest spreading to other sections will continue.

For the records of the Association there is attached a copy of the Bureau of Animal Industry's statement showing progress in tick eradication from July 1, 1906 to December 1, 1938.

PRESIDENT WESTMORLAND: Thank you, Dr. Booth. This report will be referred to the Executive Committee.

We have completed our program for this afternoon. Let us make an effort to be present at 9 o'clock tomorrow morning so that we can proceed with our program and complete it as quickly as possible.

. . . The meeting adjourned at 4:40 o'clock. . . .

ADJOURNMENT

THURSDAY MORNING, DECEMBER 1, 1938.

The meeting convened at 9:30 o'clock, Dr. D. E. Westmorland, President of the Association, presiding.

PRESIDENT WESTMORLAND: Gentlemen, the meeting will please come to order. We have a very full program today, and it will necessarily mean that our discussions will have to be cut as short as possible.

We will devote this morning to the discussion of transmissible diseases of swine. The first gentleman to be heard from will be Dr. J. H. Rietz, Associate Professor of Animal Pathology, University of West Virginia, Morgantown, W. Va., who will address us on "The Importance of Sanitation and Care in the Control of Swine Diseases."

(Applause.)

. . . Dr. Rietz read his prepared paper.
THE IMPORTANCE OF SANITATION AND CARE IN THE CONTROL OF SWINE DISEASES

By Dr. J. H. Rietz, Morgantown, W. Va.
Associate Professor of Animal Pathology,
University of West Virginia

If you consult any standard dictionary you will find that the word "Sanitation" means: "The devising and applying of measures for preserving and promoting health; the removal or neutralization of elements injurious to health; the practical application of sanitary science."

If this definition is accepted, then sanitation includes everything that has to do with preserving and promoting health and must of necessity embrace, proper feeding, housing, watering, immunization when indicated, the opportunity for a relatively high degree of cleanliness and many other factors.

Much as sanitation or the conditions enumerated in the definition are neglected, ignored, or fall short of the ideal, for all of the species of domestic animals, probably swine are the victims of the most gross neglect, if this neglect is not actually a deliberate one, so far as the opportunity for cleanliness is concerned. It is not frequent that I hear farmers say, that to be healthy swine need a mud hole and a certain amount of filth in which they may root.

I believe that most persons engaged in the investigation of animal diseases or those charged with the enforcement of sanitary regulations for the control of animal diseases are agreed that proper feeding, housing and sanitation or what constitutes good animal husbandry is a major factor governing the results that follow any attempt to control diseases. As an example: Some of the breaks that follow the simultaneous vaccination of swine for cholera, have been traced to improper diet or deficiency disturbances, or at least these were contributing factors. There are experimental data indicating rather conclusively that the treatment for gastrointestinal parasites in sheep is more effective when the host animal is receiving an adequate and balanced ration, than when the diet is narrow or deficient. There is no apparent reason why swine should respond differently.

Research conducted with Ascaris infestation in swine indicates that swine fed a balanced ration with provision for the necessary vitamins resisted Ascaris infections more effectively than swine fed a ration deficient in vitamins.
Swine, like all other species of animals, must possess a certain degree of resistance to be able to resist even the non-specific infections, and no animal can possess a maximum degree of resistance, unless adequately fed.

A questionnaire was mailed to the director of the Agricultural Experiment Station of each of the 48 states and a duplicate to the U. S. Bureau of Animal Industry, inspector in charge of disease eradication in 45 states, requesting information relative to feeding, housing, the prevalence of certain diseases and what active measures, either educational, preventive or direct control are being taken to control these diseases.

Returned questionnaires have been received from 45 states. I am glad to report that the information received from states submitting duplicates, part of which was based largely upon personal judgment, checked very closely, indicating that the data are reliable.

The persons to whom the questionnaires were submitted, were asked to estimate the percentage of farms in their state that use good, fair and poor feeding standards. Based upon swine population, the states were divided into two groups. Sixteen states with swine populations of 900,000 or more, will be referred to in this paper as the major swine producing states and the 29 states with swine populations of less than 900,000 will be referred to as the minor swine producing states.

An average of the estimates submitted by the major swine producing states that 36.5% of the farms in the major group practice good feeding standards; 34.5% fair and 29.0% poor.

The lowest estimate for good feeding for any one state of the group was 10% and the highest was 80% of the farms.

For the minor swine producing states the average estimate was 33.3% of farms using good feeding standards, 29.5% fair, and 37.2% poor.

Only 29 of the 45 states reported the kind of food deficiency diseases that are prevalent. Eighteen states reported the deficiency diseases as a combination of mineral, vitamin and protein. Eleven states reported their deficiency diseases were largely those of mineral and vitamin or protein alone.

These estimates and percentages if approximately correct, are none to good a record for the country, and if they can be stepped up about 30% to 35% in good and fair feeding practices, there is little doubt that the results would be a marked improvement in swine troubles.
Many of the Agricultural Experiment Stations have published bulletins, showing plans for hog houses, from elaborate buildings down the scale to mere individual pigsties, but regardless of this information, which has gone to large numbers of swine producers, proper facilities for housing swine are conspicuously absent from too many farms throughout the country.

I am unable to locate statistics giving adequate information concerning the number of young pigs that are lost annually from lack of properly equipped farrowing houses, but this loss is great.

Many hog houses are apparently adequate and sometimes elaborate, when viewed from a distance but upon entering these buildings on a zero morning you have the feeling of entering an ice cave and in weather less frigid but cold, these same houses are dripping with moisture. Then too often we meet with the delapidated building with part of the siding off and the roof leaking, with its wet floor, if there is a floor.

These conditions at best are predisposing factors in the development of pneumonia, influenza and allied troubles.

An analysis of the estimates from the states, relative to the housing conditions indicates that 44% of the farms in the major swine producing states are equipped with adequate or good housing facilities and for the minor hog producing states the average of the estimates was only 27%.

Of these estimates we cannot be justly proud and certainly these low estimates are not conducive to a healthy or economical swine industry.

SANITATION

In 1917 the late Dr. B. H. Ransom and his co-worker, Dr. W. D. Foster, published a report on the life cycle of the swine Ascaris and gave to the world a special kind of sanitary formula, which has become known as the McLean County System of Swine Sanitation. This special kind of sanitation was devised primarily to control Ascaris infection but when rigidly carried out not only controls Ascaris infection but goes a long way in the control of some other parasites common in swine.

The control of parasites in swine is a major problem in the swine industry, if it is not actually in first place in importance in the control of swine diseases. While the Mc-
Lean County System is a rather simple method of prevention of infestation and has been known for more than 20 years, its general adoption is far short of what it should be. Hog raisers have complained to me, that the McLean County System does not give adequate results but investigation of their interpretation of the system indicates that it was not properly carried out.

A few years ago, in a Farm School, I described the McLean County System of swine sanitation to a group of farmers living in the South Branch of the Potomac river valley. When I had finished, one of the prosperous farmers of that community asked: "Do I have to give my sows a bath?" I assured him that this was not compulsory but if he wished to continue to raise hogs profitably it had become necessary to give this bath and carry out the other details of the system as described. This farmer assured me he would not do this, and I stated that he owned the hogs and that my only interest and part is in giving instructions. The following year in this same school, I was again one of the instructors and when I had finished this farmer arose and stated: "I am the man who told you last year that I would not give my sows a bath, but I did, and I carried out the details of sanitation as described by you and I have the best crop of shotes I have raised in years." This was the beginning of the use of the McLean County system of swine sanitation in that part of the Potomac valley that lies in West Virginia.

Reports from each of the 16 major swine producing states indicates that the control of parasites is a major problem confronting the swine industry of their state. A like report was received from 22 of the 29 minor swine producing states. Four of the western range states and three eastern states, with small swine populations reported no such problem.

Only four of the major swine producing states reported the McLean County System of Swine Sanitation in general use, this leaves 12 of the major swine producing states, where sanitation for the control of parasites is not in general use, even though they report that the control of parasites is a major problem.

Eight states of the major producing group reported that communities of considerable size have adopted the system and eight reported that no communities of considerable size have adopted the system, leaving only individual farmers who make use of this system in the control of parasites. Nine states reported that the use of the McLean County System has increased during the past five years and seven reported
no increase. All agree that there is further need and that benefits have been derived when used.

All of the 29 states belonging to the minor swine producing group, excepting the seven states, that reported parasites not a problem, are agreed that there is need for use of the McLean County System of Swine Sanitation and that on farms where it is used that parasitic infestation has been decreased. In nine of the states in this group the McLean County System is in general use.

From the reports from the various states it appears that much educational work is yet to be done in the control of parasites in swine before a utopian state is reached.

IMMUNIZATION

It has now been some 30 years since the late Dr. M. Dorset and his co-workers, Dr. W. B. Niles and Dr. C. N. McBryde, gave anti-hog cholera serum to the swine producing world for the control of hog cholera.

This serum with the proper use of virus has proven itself practically 100% effective in the immunization of healthy swine against cholera. It would appear, with such an immunizing agency available, that cholera in hogs should be as rare today as smallpox in man, but this is not the facts. Individual outbreaks of cholera are almost as numerous today as they were 20 years ago, even though the aggregate losses have been reduced. Too many hog raisers wait to immunize until after the disease appears and then, of course, there is a mad rush for serum and virus, and losses ensue.

Thirty-eight of the 45 states that gave reports, stated that cholera exists to a considerable extent in their state, while the seven states that gave negative answers to the question, have small swine populations and most of the swine population is to be found in garbage feeding plants near cities and vaccinating is universally practiced on all admittances of swine to the plants.

Thirteen of the 16 major swine producing states reported that the simultaneous vaccination of swine is in fairly general use before the appearance of the disease. Three of the states reported negatively.

Six of the major swine producing states reported a material decrease in cholera due to pre-vaccination during the past five years, and ten of the states reported no decrease in cholera, due to pre-vaccination, during the past five years.

Thirteen of the states listed in the minor group as swine producers, reported a decrease in cholera due to pre-vaccina-
tion practices and 16 states reported no decrease during the five year period.

This would indicate that ten of the major and 16 of the minor swine producing states are not extensively practicing pre-vaccination or immunization as a preventative for cholera.

There is apparently ample need for further educational work in the control of cholera in swine.

SWINE ERYsipelas

From notations made on the questionnaire received from the states it appears that there is a belief that sanitary conditions in the more narrow definition has a bearing on the prevalence and persistence of swine erysipelas on farms and in communities. On some of these reports the statement was made that this disease is filth borne and that the feces of swine are a potent factor in its dissemination and the accumulation of feces acts as a reservoir for the retention of the infection on premises.

Of the 16 major swine producing states, 12 reported that swine erysipelas is a problem and four reported the disease as not a problem at this time but did not state, not present. Of the 29 minor swine producing states five reported this disease as a problem and 24 reported, not a problem, but did not state, not present.

The 12 major swine producing states reported the extent of swine erysipelas, few cases from four states, increasing from three states, extensive from two states and marked, considerable and question from one each of three states.

Only seven of the minor swine producing states reported the existence of swine erysipelas in their state and five reported limited and two as increasing.

Of all the states reporting, only five reported that measures are being taken for the control of this disease and where notations were made regarding methods of control, they consisted of quarantine and administration of serum.

SWINE INFLUENZA

So-called swine influenza usually appears soon after sudden changes in the weather, when swine are not properly protected against such changes, moving of swine in open trucks or unprotected in shipping, assembling swine at shows or fairs where the housing is usually not of the most approved standard.

Twenty-five states reported that so-called swine influenza is a problem of the swine industry and 20 of the states report
no such problem. None of the states reported any great prevalence of this disease. Notations on the questionnaire consisted of "few cases, isolated cases, at fairs and at swine shows."

Nine of the 45 states reported that active measures are taken by their states to control this disease.

Exposure to inclement weather due to faulty housing is undoubtedly a predisposing factor in the development of this disease and considering the estimated low percentage of adequate and good housing facilities for the entire country, probably considerable could be accomplished by way of control by instituting good housing educational campaigns.

**PIG TYPHUS OR NECROTIC ENTERITES**

In answer to the question, "Is necrotic enterites in swine a problem in your state?" The 16 major swine producing states were unanimous in stating that this disease is a problem.

Of the 29 states in the minor group, 16 answered, yes; seven, no; and six did not fill in an answer to the question.

It is generally conceded that necrotic enterites or pig typhus is a non-specific filth borne disease, and the prevalence of this disease over so large an area of his country, should be ample evidence, to serve as a direct indictment of the sanitary conditions under which swine are produced, in so far as sanitation refers to cleanliness.

This disease also has a direct bearing upon the results that often follow the simultaneous vaccination of swine for cholera. Many of the breaks that follow such vaccination can be directly traced to the existence of necrotic enterites in the swine, before the serum and virus are administered.

Several years ago, I was called in conference to one of our states, where breaks following the simultaneous vaccination of swine was the rule, rather than the exception. After checking farms where such breaks occurred, I advised the veterinarians, who were called in conference, to refuse to vaccinate any hogs that were kept under filthy conditions or where there was evidence of heavy parasitic infestation, until the swine had been removed from such filthy conditions, to clean pastures for a period of at least three weeks and in cases where parasites were involved, that treatment for the removal of parasites be given before the serum and virus are administered.

Under a system of this kind breaks in that state became the exception rather than the rule.

Beside the losses caused by complicating other diseases,
necrotic enterites exacts an enormous toll from the swine industry of this country as a distinct condition within itself. Much of this trouble can be avoided by the providing of cleaner quarters for swine.

EDUCATIONAL PROGRAM

All 16 of the major swine producing states and 21 of the states in the minor group report that they conduct an educational swine production program and each of these states credit the program wholly or in part to the extension service of the College or University. Too many of the states reported that no specific educational program in connection with cholera, erysipelas, influenza or necrotic enterites is conducted. This indicates that the educational program so far as disease control is concerned is considerably neglected in too many of the states.

One of the states listed in the major group reported that the educational work in connection with cholera and erysipelas is in the hands of the local practitioners.

I wonder how much time the average practitioner spends in advising and instructing the swine producers in the effects of unclean conditions in its varying ramifications, upon the development of swine ailments. How much instruction is given on the effect of illy constructed houses, poor feeding, poor ventilation and their effect upon the health of swine? This condition can be improved by extension work with this group of veterinarians.

Animal sanitation in its broad significance is a specialized subject and as we know, few of our states have a definite and active animal disease extension service, directly connected with the Agricultural Extension service. I am again doubtful if swine sanitation is receiving the attention it should receive as a disease prevention and control program.

Are farmers receptive to instruction in these matters? My observation is, that they are receptive. Allow me to relate one experience in a community in the county in which the University of West Virginia is located.

A farmer came to my office looking for advise regarding a disease of swine that had been prevalent in his community for several years. The most noticeable symptom was paralysis, usually beginning in the posterior limbs. After he had told his story, I asked regarding feed and management.

They were in a pen 40 feet square and were fed wheat middlings, popularly known in that community as red dog flower and kitchen slop.
I explained as best I could what this ration lacked in nutrient, mineral and vitamin requirement for the body and advised the additional feeding of yellow corn, steam-bone meal and cod liver oil. I also stated that these hogs would probably get up in a week. About one year later this man came to my office again and told the story of these hogs. He said, he did not believe what I had told him a year ago, but decided he would try the treatment, I had suggested. He also related that I had said these hogs would get up in a week. He then said they did not get on their feet in a week. It took eight days.

That community is now doing a better job of hog feeding than they did before this incident occurred.

Possibly this condition only exists or largely exists in that part of the country where only a relatively few hogs are produced for home consumption only.

In West Virginia this herd of hogs numbers about 200,000 and in all of the minor swine producing states as well as parts of the major swine producing states, there is a comparable herd of swine that means a meat or a no meat diet for many farm homes. This herd is worth the educational effort, to provide meat for thousands of rural homes.

SUMMARY

Considering the average percentage for feeding standards as given in the questionnaire as reasonably accurate, (36.5% good, 34.5% fair, and 29.0% poor for the major swine producing states and 33.3% good, 29.5% fair and 37.2% poor, for the minor swine producing states) we can roughly assume that one-third of the farms of the country practice good feeding standards, one-third fair and one-third poor. This feeding situation accounts for the known food deficiency diseases and probably accounts for many of the obscure and undiagnosed conditions that are found among swine.

Low feeding standards probably have an influence in reducing general resistance to many infectious conditions in swine and acts as a complicating factor in many specific diseases.

The average percentage of farms with approved and adequate housing facilities is slightly above the feeding standards (44% for the major swine producing states and 27% for minor), but is too low for either group and undoubtedly has an influence in lowering resistance or at least is a predisposing factor in influenza, pneumonia, bronchitis and other respiratory disturbances.
Sanitation, both general and special, is probably the most neglected condition in swine husbandry, this is reflected in the prevalence of filth borne diseases and the wide spread parasite problem.

The educational swine production program in so far as sanitation is concerned for disease prevention is apparently far short of what it should be considering the agencies and facilities known for protection of swine against many troubles and diseases that are now quite prevalent.

PRESIDENT WESTMORLAND: Thank you, Dr. Rietz. I am sure this organization appreciates your contribution to this program. Discussion on this paper will be made by Dr. K. W. Stouder, Extension Professor of Veterinary Medicine, Iowa State Colleges, Ames, Iowa.

DR. K. W. STOUDER (Iowa): Mr. Chairman and Gentlemen:

I was particularly glad the other day to have the opportunity of glancing over Dr. Rietz's paper and to note that the situation, in Iowa at least, was not worse than it was in any of the other states, and that perhaps we stand at about an average.

Being about the largest hog raising state in the Union, perhaps we have some reason to have the large amount of sanitary problems in pork production that we do have. Perhaps, on the other hand, we should stand as a sort of example for leadership.

My remarks will not be very extensive, because I feel that Dr. Rietz has covered the subject extremely well. But concerning parasites I would like to make this contribution, that after years of observing conditions in the field, and having the problem of teaching parasitic control, I have come to believe that the more emphasis we can lay on the fact that the larvae of many of the internal parasites pass through other organs such as the liver and the lungs in their development, and do in those organs a damage to the animal body which is probably never completely repaired, we catch the interest of the swine producer and teach him the futility of looking toward vermifuges as a relief of his trouble of particularly, say, the ascaris invasion of his hogs.

I feel sure that, that story as revealed by the entomologist can be made attractive and interesting to the farmer, and many of them, when they see and hear it, do comment that it has given them information that they never had, and there-
fore makes it possible for us as sanitarians to get their cooperation in doing such details as thoroughly cleaning and washing the sow, as well as thoroughly preparing the farrowing pens, which is extremely important if we are going to make a good showing as sanitarians by the number of hogs that will be produced on that farm the year that we try to make our demonstration.

In this matter of influenza, I have been convinced for a long time that it is mostly a matter of housing. There was a time, many years ago, in our state and doubtless it existed in other parts of the United States, when farm income was sufficient to permit men to expend considerable sums of money in building hog houses. Many of them built a very fine hog house. They usually had an engineer as a consultant, and perhaps only the local carpenter or, perhaps, a set of plans from a lumber yard, and the effort there was very largely to make a building that had good appearance from the road, and that had some few bits of theory as to, say, the lighting of the rows of pens, constructing therefore a half-monitor type house with two rows of windows, and a building that soon sagged and permitted the place to become very drafty in just a short space of time.

In other instances the gable type house was built, with a couple of big areators on the peak that tended to suck the air out of the house as rapidly as it could be drawn in at the doors used for entry for the pigs. This sort of house usually was one of two extremes in stormy weather—it was either a very cold place, due to floor drafts, or it was perhaps, for a day or two during the height of the storm, if the area became filled with frost, a very close, damp place in which the hogs could become excessively warm, and then as they went outdoors they became suddenly chilled, and they had the old string of respiratory troubles that we have generally grouped, at least in the hog yard, as influenza.

My teaching to hog raisers as a prevention of that trouble—and I know that it is also the custom of a good many practicing veterinarians—is that the need is for less ornamentation and more practicality in the construction of their hog houses. In the first place, in my judgment a hog house should be a building of rather low roof construction. A five-foot wall is entirely adequate, and the gable type roof is much the best. There should be ventilation, however, and ventilation does not mean draftiness. It means keeping the air inside the building, as much as possible, as fresh as it is outdoors
from the standpoint of moisture content and oxygen content and, of course, odors.

This can be done. I usually recommend the closing up of the building tightly, if it is a building that would quickly lend itself to that method, building of air shoots from the areators or just simply open holes in the roof, down to within a foot of what will be the average of the bedding on the floor. That will box in and close in and keep in the air that these animals' bodies will warm.

Then, I recommend the opening under the plate, between the roof rafters, and usually see to it that the total area there is at least twice the outlet area, and that these outlets have not more than about ten to twelve feet pull on the floor; in other words, two of them not more than 20 feet apart. Box in under the roof rafters so that when the air comes in under the plate, it enters the building well up toward the peak. That means it is going to mix with the warmer air of the building, and the air carrying the most moisture is going to be somewhat colder, and will tend to fall in rolls, and tumble onto the bottom, and the air currents across the top of the outlets will carry out a tremendous amount of the moisture in that building.

Now, the animals must be permitted to come in and go out of that building. The only type of door that I have ever seen that is adequate to permit animals to come in and go out of a building at will, which will solve this whole problem, is the tunnel, with two bends in it, a bend on the outside and a bend on the inside, with the inlet of the tunnel close to a corner of the building.

In other words, when the hogs come into the building they come in, in a sort of S. The air can blow from any direction and not more than a little of it will come in, and then it will be only when the wind is from the one direction that opens directly into the outside mouth of the tunnel. That solved the problem on many a farm. I have had many men, after discussion of their housing problems and that pointed out to them, put it into use, and later tell us that it has been a godsend in the reduction of not only pig losses from pneumonia in the early spring farrowing season, but in the prevention of influenza.

The other thing that I should like to recommend to a farmer raising market hogs is the open shed. A deep, open shed, open to the sow. Let him make it of whatever he will. Many of them will put up poles and blow straw into it at the time of threshing. This can be used for two or three years,
or whatever time may seem to be convenient and right for the sanitation of the hogs, after which it can be destroyed, either by carrying it out and spreading it as manure over the plowed land, or by burning it.

This problem of erysipelas, in Iowa at least, as I feel, is becoming one of considerable importance. I think we all agree we need funds for our research men to be given the privilege of studying the disease, that is, studying the artificial immunization of the disease more than they have had opportunity to do as yet, because it is not so easy when you diagnose for a stock man, that his animals are suffering from erysipelas. It is a known specific organism. They identify it with reasonable ease and certainty. We have had this information for a considerable number of years that we do have some means of ameliorating the condition in the herd, but we cannot give him anywhere near the assurance that we can check and hold in check erysipelas on a farm, that we can hold hog cholera in control. And for that reason I say our research men should be given more funds to study and develop some means of practically immunizing the hogs against swine erysipelas, because it is a disease of increasing importance in our territory, in fact, it is a disease that can be and has been transmitted to man, and that makes it of some more importance.

There is the old story of enteritis upon which we could dwell for a long time and not exhaust the material. I am going to say only that it is about as frequent as it ever was. As soon as a man lets down a bit in the sanitary management of his herd the animals get the form of enteritis that we most frequently see, which I like to call pig typhoid. I believe if we get to the farmers in terms and on a ground that they can better understand the cause, in their own minds they will think to some extent of the logical means of prevention. Indeed, I feel that the average man knows that the control of human typhoid is one of prevention, and as it is important to prevent it in man, pig typhoid is best prevented by good sanitation.

However, in the last few years we have had experiences which our research men tell us is due to something else. When a farmer has brought in some stock hogs from somewhere, or when he has procured the animals from a public sale, a community sale or something like that, that is where most of them have had their first contact with it, and the farmer calls the disease bloody diarrhea. That situation is bad to handle. My experience, in the end, has been that the
loss of the herd is complete, either by death or by such damage that the farmer does not get out of the animals even enough to pay for the feed.

We all agree, I am sure, that swine sanitation, like a good many other problems of livestock management, is pretty largely one of education. We have never had an animal husbandry project that can succeed unless sanitation is a part of that project. There is nothing so discouraging as to have what appears to be a good breeding or feeding program going on, and then have disease or parasites enter the picture and destroy all the good work done, perhaps for several years before that.

Recognizing this in our adult or extension teaching at Ames, we always (and for many years this has been the custom among animal husbandry specialists and the veterinary specialists) discuss and lay plans before any project is actually put into the field, and we plan how the sanitation will work in with the livestock teaching subjects that they propose to institute. In teaching profitable sheep husbandry we join as a veterinarian with the sheep specialist. In teaching cattle feeding, cattle management, we join, also. The dairy production men are counsellors and we ask their assistance. We work extensively with them, and so too with poultry production.

Now, the teaching of profitable pork production we now carry on in our extension teaching as a project known as profitable pork production. That is its title. If a county or community wishes information on that subject, they sign up for it, and say that they expect us to teach them types and breeds and the selection of market types of animals, the feeding and management of them, and that sanitation will be a part of every one of the discussions somewhere along the line.

For example, in the fall of this year, when most of our projects begin, this project was requested by 21 counties in our state, and an animal husbandry man and myself will give the people of those 21 counties information on this project. At every meeting we emphasize the fact that a measure of a brood sow’s productive capacity is the pounds of pork that she will deliver at weaning age. Since profitable pork production is the goal that a man really is shooting at when he starts.

Then we emphasize the fact that this cannot be the maximum unless he has first a good sow, well selected, with a breeding record back of her as to size of litter, how well they
have nursed, and so on. Also, it would not make much difference how valuable the sow was, what good record she might have as a family sow; if sanitation was neglected it would probably be blown up in some manner.

To illustrate the value of good pasture, for instance, in the reducing of the cost of pork production and increasing the speed or rate of gain in order that they may meet the most advantageous early farm market, we often get some of the more advanced thinkers in a county, who are participating in this program, to set up pasture versus dry lot, or good pasture and poor pasture feeding demonstrations, taking five pigs out of their drove and putting them into different lots on the same pasture, and then putting five more in a somewhat different pasture. You may wonder how we get the fencing to keep so many lots of pigs on one farm. We usually do that by knowing the road maintenance men in the community, and we use the snow fences in the summer.

These have been fed various rations on good and poor pasture and dry lot, and our primary purpose is to show the value of proper nutrition and the value of sanitation, and the man gets a reward for any extra work he may do.

The actual figures show something like this in one county last year with 20 different groups of pigs: An average of 20 such trials, 1 year, showed that pigs which got corn in a simple mineral mixture made gains of .76 pounds daily, while pigs on the same pasture, but which got a little better nutrition because we added tankage to that basic ration, showed .93 pounds daily. There we taught the man the value of a properly balanced ration.

The same strain of pigs on good pasture gained 1.31 pounds daily. There the farmer almost doubled the daily rate of gain in his pork production when he gave them good pasture. Corn, minerals and tankage on the same pasture, 1.61 pounds daily. Any man, even if he does not believe in the theoretical things as some of them like to term them, whom we teach regarding the value of going out on good pasture, will be appealed to if you show him that he can make a daily rate of gain of 1.61 pounds if he has a strain of hogs that are worth keeping, and if he puts them on the sanitation that we suggest.

And then, when a marketing specialist comes along and shows him that market curve for a 180 to 200 pound hog, which begins to dip after October, as is so often the case, and tells him that he ought to meet the September market and
thereby gain perhaps another $1.00 per hundredweight, he will see the logic in that specialist's argument.

In conclusion I want to say that we try to devise teaching methods that will ultimately reach the farmers as a whole. We know there are some people we cannot reach by direct teaching, and we have to reach them by example, showing them that someone else in their neighborhood has set up and proven that it is a practical possibility; rivalry, some times, will cause them to accept these things.

Adult education is increasing everywhere, as the demand for more information and forum discussion for leaders in groups testify.

Our stock men should keep abreast of the times, and avail themselves of the scientific findings that are constantly being developed by our research laboratories. I would say that the livestock industry needs more veterinary trained men who can interpret and translate into terms that the average stock man can use in his daily business of producing meat and milk, for the best dissemination of this information.

Thank you. (Applause.)

PRESIDENT WESTMORLAND: Thank you, doctor, for this discussion on the subject.

The next paper is "Community Sales as a Factor in the Spread of Swine Diseases," by Dr. F. A. Zimmer, State Veterinarian, Columbus, Ohio. (Applause.)

... Dr. Zimmer read his prepared paper.

COMMUNITY SALES AS A FACTOR IN THE SPREAD OF SWINE DISEASES

By Dr. F. A. Zimmer, Columbus, Ohio
State Veterinarian

The stage for the development of livestock auctions has been gradually taking shape for many years. No one single development in livestock marketing can be said to be responsible for the growth of these organizations. Probably, the most significant contributing factor was the rapid improvement in methods of livestock transportation. Each stage of the transportation history has been paralleled by a corresponding change in the methods of selling and buying livestock.

In the middle of the Nineteenth Century the railroad began to take prominence as a common carrier. Soon after its in-
ception the railroad monopolized almost all forms of transportation, thus making the droving of cattle and transportation by water obsolete. During the reign of the railroad as a common carrier the terminal stock yards and terminal commission companies flourished. However, with the establishment of good roads and rapid improvements in motor vehicles a new factor was thrown into livestock transportation.

From a competent authority, it is noted that the holding of auctions in America took place at a very early date. Sales were held in New York City as early as 1676. The selling of commercial livestock at public auction has been an established custom for centuries in Great Britain.

One of the oldest American livestock auction sales was established in 1853 at London, Ohio, by a group of men under the name of the "Madison County Importing Company." From 1853 to 1912, a period of 59 years, this sale was of much importance. About 1900 it became primarily a horse auction. Following 1912 the sale of livestock was unimportant, although, until 1919, there was considerable business activity in London on sale day.

In 1911 an auction sale was started by a group of Menno-nite farmers in Berlin, Ohio. This sale handled mostly miscellaneous merchandise at first, but it handled more livestock after a few years of operation. This sale is still functioning after 23 years of continuous operation.

Although the Corn Belt States were first in developing the livestock auctions, other sections of the country began to try the experiment. Hog sales were started in Kern County, California, in 1917. In 1919 seven counties in the State formed the California Farm Bureau Marketing Association and cooperated in conducting periodical sales. During a period of 6 years ending in 1924, the association held 1,008 sales, the hogs selling at a total valuation of $5,780,200.

Selling at auction has long been practiced in many states, starting in the early days at the county seat sales but we have witnessed a great revival of public sale interest in the last 6 years, as over 80 per cent have come into existence during this short period of time.

Auctions bring farmers and owners of livestock face-to-face with the purchaser and they become in some extent social gatherings. In some sections managers of auctions have started to hold their sales at night so the farm people could attend. Merchants living in small towns where a good market and sale crowds are maintained have reported a huge
increase of business on days that were known to be slow sales for the farm trade.

The auction sale affords the farmers and others a close local market and this may be represented in carload lots of livestock as well as an outlet for the farmer with a small number of livestock to sell, thus serving a useful purpose. During the last 6 years, the dollars obtained at such markets were mighty welcome to a great many rural people and others and thus the auction market was a means of bargaining when other means seemed to be slow and far away.

It has been said that while the depression is possibly not the mother of auction markets, it has strengthened and increased them to a great extent. As our economic conditions improve, the auction business will have to prove itself a cash market in comparison to other centers and the sale management must be kept financially sound and morally honest if they are to survive and promote public confidence. From the standpoint of ownership, we find some auctions being operated by individuals or a group of individuals in the community.

Sometimes a retired farmer or an old-time stock buyer will own the auction or several markets. Other auction sales are owned by the producers themselves or their agents, and some commission firms own and operate such markets. At some auction markets you will find everything from an opossum to a shot-gun is put up and sold. Some auctions refuse any merchandise, except livestock and farm machinery or goods consigned by farmers. There is still a third group not selling any merchandise except livestock.

As to facilities and location of auction sales, we observe these markets are held in old livery barns, a vacated factory, made-over buildings, fair grounds, railroad yards or some place in or adjacent to a city where unloading and reloading is convenient. The type of building used varies almost as much as the type of merchandise sold.

The sanitary conditions of some markets, on account of improper floor materials and drainage, are almost impossible for effective cleaning and disinfecting. There are, however, a great many markets that are equipped in an excellent way and the purchasing public should be encouraged to patronize such centers of sale. This suggestion prompts the statement that a fertile field for an educational program awaits sanitary officials in our relationship to Auction Markets.
OBJECTIONS TO AUCTION MARKETS

One objection to auctions is the lack of information concerning the true value at the terminal markets. Some auctions have United States market news information available, others have a radio, but many of them give no market information, and have no way to judge the true value of the stock. Of course this situation cannot be taken care of by law. It is a matter of which the buyer, and in many cases the seller, must beware.

Another objection to auction markets is the fact that a number of them do not represent a firm financial institution, and at some markets the farmer who consigns livestock to the auction market has no financial guarantee that he will receive his money, only a moral obligation between the sales manager and himself. This is a very important subject relating to auction markets when we consider some markets are doing over a million dollars worth of business in a year.

Another objection is whether or not there exists honest competitive bidding. It is understood that some markets have from eighty-five to ninety per cent of the livestock bought before it is sold. Some markets will not buy livestock of any kind and they operate primarily as commission agents. This possibly seems to be the more desirable type as it is not conducive to by-bidding, which is a very important part of the auction business. It should be considered that the auction market is a buyers market and the highest bidder should get the goods. Since the very spirit of any auction is one of competition, the market that will continue to operate must be run open and above board in such a way that the highest bids are accepted and the merchandise or livestock presented for sale is in the hands of a new owner.

There is one glaring objection to auction markets and that is the consequent spread of diseases affecting livestock. Without a question it is impossible to bring livestock together from various farms and to shift ownership without spreading diseases from one farm to another. A great number of the livestock sold through public auction may have come from a distance of 100 to 500 miles and it is difficult to know the origin of many of the animals and the condition of the herds from which the animals are moved.

Livestock free of diseases may leave the farm for an auction market but they are exposed in the truck and in the pens at the yards. A few days after such livestock reaches the farm the purchaser is aware that they are affected with a
disease which usually results in a severe loss to the owner and from this center of infection the disease may be spread to the livestock on the farms in the immediate vicinity.

The livestock industry of our states cannot be protected against diseases if there exists a huge number of cesspools of infection from which it is possible to spread the various diseases to which our livestock is heir.

Time would not permit for a complete report from all states having auction markets, and their relation to the spread of swine diseases. However, a request for some information as to the number of sales, the laws and regulations that apply to such markets and the spread of swine diseases was sent to the State Veterinarians of the twelve following states: Arkansas, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, West Virginia, and Wisconsin.

The Sanitary officials of these states promptly cooperated by sending their reports for which at this time I express my appreciation and thanks. Quoting in part from a few of these reports:

"The spread of swine diseases from auction markets is certainly one of importance and has caused the writer a great deal of concern during the past few years."

"At the present time we have adequate laws for the inspections, but no finances. Our Legislature this year will probably arrange for the finances, as the public is beginning to demand this."

"Might advise for your information that hog cholera has increased 84 per cent since the beginning and widespread use of the auction sales barns. Up to that time we had no swine erysipelas, but lately have been able to trace several cases of this from hogs that had been imported from an infectious district."

"We do not have any laws or regulations covering these sales, and veterinary inspection is maintained only at one sale."

"The auction sales are, in my opinion, one of the greatest sources of diseases affecting livestock. We have had many outbreaks of hog cholera in animals purchased through these sales, and in many cases farmers have not only lost all animals purchased, but have brought infection on to their farms, which spread to other hogs on the place that were not immunized, and they also died of cholera. The same may be said concerning other swine diseases."

"The marketing of livestock, the same as everything else, is changing. We, as sanitarians, should, in my opinion, recognize that this method of marketing will extend and increase, and realizing that under every possible restriction and requirement they will be a source of the spread of infectious diseases, we should not discourage
but rather encourage them and do our part as sanitarians to cooperate with them."

"Our methods of handling feeder pigs in auction markets is only partially satisfactory and much improvement is desirable. We are simply doing the best we can with a bad situation."

"The results, whether good or bad, depend on the efficiency with which the veterinarian performs his duties. When the veterinarian is careful to see that untreated feeder hogs do not leave the yards and does not treat sick hogs, the results are uniformly good."

"We have had but little swine erysipelas in the state so far as we know and no reports of the disease having been spread through auction markets. We have occasional reports of necrotic enteritis in stockyard pigs, which were no doubt infected before they entered the yards."

"We have no state statute providing for regulation of such sales. The veterinarians supervising sales do practically nothing in regard to cattle, but do vaccinate the hogs. There are a few sales which do not comply with even the hog vaccination requirement."

"We need a state law and after our experience with these regulations, believe we would make some changes."

"I believe there should be a license fee and, also, that supervisors of sales should be state employees responsible to the Department."

"We do not have a definite record of the number of cases of disease traceable to community sales. The complaints mostly concern hogs and a large number of these are received."

"We have, in this state, one hundred seventy-two community or auction sales and I think, without a doubt, these sales are responsible for more outbreaks of disease, especially disease of swine, than any other one thing. We have no law in this state whereby we can regulate such sales, however, we will present to the Legislature in January, a bill whereby we hope to be able to regulate these community sales."

There are, as reported, in the above listed states 1,194 auction markets and statistics show that almost 3,000 of these markets are in operation in our forty-eight states.

AUCTION SALES IN OHIO

It has been stated that Mr. James Caldwell, a native of Paris, Kentucky, has probably done more towards instituting the livestock auctions in Ohio than any other man.

Since the introduction of the Kentucky methods into Ohio the development of sales throughout the state has been rather spontaneous.

The records show that in 1930 there were 3 sales, in 1935-1936 115 sales and today there are 73 sales located in 53 of our 88 counties.

During the period from 1930 to 1936, the office of the State Veterinarian received many reports daily that the various
diseases affecting livestock were being disseminated from auction sales and a huge loss was sustained each year. This loss, however, was caused primarily by the diseases affecting swine and sheep. The results of numerous investigations, during this time, substantiated the fact that the diseases of swine, such as cholera, necrotic enteritis, so-called flu, erysipelas, and mange were originating from auction sales which were being used as a dumping ground by the unscrupulous farmers and livestock dealers. In many instances some of these diseases became epidemic in nature and of wide-spread importance.

This situation recognized as a serious menace to our livestock industry, with a valuation of over 200 million dollars, coordinated with a wide-spread criticism and condemnation of the auction sales prompted the Ohio Legislature in 1935 and 1937 to enact and amend a law.

This Act, as the title indicates, was "To prevent the spread of infectious and contagious diseases of livestock; to require dealers and brokers to be bonded and licensed; to provide for the revocation of such licenses; to provide for the inspection and disinfection of yards, pens, premises, and vehicles; to confer powers on the Department to promulgate and enforce rules and regulations; and to provide penalties for violations or refusing to comply with any provisions of the Act."

As an aid in the control of diseases, we have found one section of this law to be of extreme value and a part of this section reads as follows: "The Department shall require an inspection and such treatments necessary to prevent the spread of diseases of all 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 inspections and treatments shall be made by a veterinarian approved by the Department."

While the application and observance of this law in Ohio is not 100 per cent perfect, it is a fact that a step has been taken in the right direction from which there will accrue an excellent protection to our livestock industry and its allied interests.

Since the law became effective on September 1, 1935, we note from the records that there has been a marked reduction in the spread of swine diseases, especially cholera. Over 480,000 swine have been inspected and immunized against cholera at our auction markets and almost 100,000 swine were
vaccinated before they were presented for sale at these markets.

Over 429,000 sheep have been inspected and dipped under veterinary supervision resulting in the placing of Scabies under control.

It may be of interest to comment on the special bonding provisions of the Ohio law which requires for auctions a bond representing the peak day of dollar volume of business transacted during the previous twelve months.

- **Number of auctions bonded and licensed**: 73
- **Amount of bonds**: $553,200
- **Bonds vary from**: $1,000 to $35,000
- **Average amount of bond**: $7,578
- **Number of bonded and licensed dealers**: 701
- **Amount of bonds**: $811,000
- **Bonds vary from**: $1,000 to $22,000
- **Average amount of bond**: $1,015

The bonds of auction market operators and dealers provide for the prompt payment of the proceeds for livestock and the fulfillment of all obligations incurred and provided under the license which prevents the dealing and trafficking in diseased livestock.

In the application of The Federal Packers and Stock Yards Act in Ohio 12 yards have been posted and the bonds in operation under this Act amount to $203,000. As a result of the State and Federal Acts, we have a total bonding of auctions and dealers amounting to $1,567,200.

**SPECIAL RECOMMENDATIONS RELATING TO THE CONTROL OF SWINE DISEASES**

1. Efficient veterinary inspection should be established at all auction markets and this inspection should be developed so that it would be uniform to federal inspection as maintained at public stock yards.

2. Veterinary inspection should be under the direct control of the State Veterinarian and the inspectors should be paid from a budget provided for this office.

3. Stringent requirements should be established to provide proper facilities for the receiving, yarding and handling of swine to overcome the many objections of improper housing, sanitation and location of yards.

4. Local accredited veterinarians could be used to administer the necessary treatments to all swine before they are
returned to the farm for further feeding or breeding purposes. Such treatments should be under the direct supervision of the official inspector in charge of the market.

5. All auction sales should be required to install practical equipment for the cleaning and disinfection of trucks and the yards. All trucks used in delivering swine to these markets should be inspected for cleaning and disinfecting but trucks used in transporting diseased swine should be thoroughly cleaned and disinfected before being moved from the premises of the auction.

6. All swine inspected, treated and delivered to or removed from an auction for purposes other than immediate slaughter should be accompanied by an official certificate issued by the inspector showing the origin, description, identification, condition, the treatment given and other information as may be required on the certificate form.

7. All swine purchased at auction sales or from dealers and others, when the condition of the herd from which the animals originated is unknown should be kept in quarantine and isolated for a period of at least 21 days.

It is recognized that many problems intricate and extremely complicated are associated with auction, community or as sometimes called calamity sales, and it behooves each state to establish the best possible program under its laws and regulations in solving a serious menace of disease control and eradication.

In closing this discourse, I am hopeful that you have obtained some beneficial information as it has been a pleasure and an honor for me in preparing and delivering this paper to you.

PRESIDENT WESTMORLAND: Thank you, Dr. Zimmer. I am sure we have all enjoyed your report on this subject.

The discussion on Dr. Zimmer's paper will be given by the members in the audience, as Dr. Curry is not here. Does anyone have any questions he would like to ask Dr. Zimmer? If not, we will pass on to the next subject.

"Brucella Infection of Swine," by Dr. S. H. McNutt, Associate Professor of Veterinary Research, Iowa State College, Ames, Iowa. (Applause.)

... Dr. McNutt read his prepared paper.
A number of partial surveys have been made to determine the prevalence of Brucella infection of swine in this country. The agglutination test has been employed in these surveys. The report by Weeter seems to give the highest percentage of infection. He found about 20% of sows and 7% of barrows reacted in 1:50 or above. In Iowa about 2.5% of all hogs react to the agglutination test. Boak and Carpenter found slightly less than 2% reactors in hogs from the states to the east and south of Iowa. They also report that about 0.2% of hogs in New York state react. In Canada, Gwatkin found about 1% reactors. Reports from France and Northern Europe indicate that there is little or no suis infection there. In Germany considerably less than 1% are reactors. Knoth found only one reacting gilt out of 1,000 tested. He found five reacting sows in 376 samples tested. In England, Priestley obtained no reactors in 517 tested and Doyle 25 reactors in over 10,000 tested, a total of 0.2 of 1%.

In order to shorten this paper, citations of the literature are omitted as much as possible. To make up for this deficiency a partial list of the material reviewed is appended. Because of the close inter-relationship of Brucellosis of all animals it is impossible to limit a discussion to swine alone. Hence some mention will be made of Br. abortus and Br. melitensis.

The Brucella group, or genus, of microorganisms is unique in that it contains but three species. The first member of this group is Brucella melitensis. Goats, and perhaps to a limited extent sheep, are its natural hosts. The second member is Brucella abortus with cattle as its natural host. The third member is Brucella suis which primarily affects swine. These then are the species of Brucella and the animals indicated are the ones that keep the respective species alive and from them other species of animals contract Brucellosis. With minor exceptions other species of animals do not contract Brucellosis readily enough from one another to serve as reservoirs of this group of micro-organisms. Melitensis was shown to be very closely related to abortus and suis only about 20 years ago. This relationship, which was not suspected up until that time, is so close that much effort has since been required to separate them into the three species. Pasteurella tultaren-sis resembles Brucella slightly and Alcaligenes bronchisep-
ticus very remotely. The Brucella are not known to be similar to any other microorganisms. It is recognized that living organisms are in the process of change from one generation to another. With the simple organisms such as bacteria the changes may be pronounced in a short time. Thus the question has arisen as to whether or not one species of Brucella can change to another. Records of such changes or suspected changes are so rare as to make it doubtful if they ever occur. Passage of a strain through a foreign host has not changed the original strain. Thus many passages of abortus through swine have not altered the original abortus strain. Changes in suis strains are prone to take place in laboratory cultures but such changes render them less pathogenic or non-pathogenic. They are even less like abortus than they were originally. In a larger sense, Brucellosis of swine may be defined as that disease of swine caused by infection with any one of the Brucella organisms, but in a narrower, more correct sense, it is caused by Brucella suis which was first described by Traum and later named by Huddleson. Swine can be infected artificially with abortus but the infection is of very short duration and aside from agglutinins in the blood symptoms are rarely, if ever, observed. Hogs associated with abortus infected cattle have suffered no ill effects. Such exposures under controlled experimental conditions have failed to demonstrate appreciable infection of swine. In general, attempts to infect swine with melitensis has been more successful although some attempts have failed. Melitensis appears to be more dangerous for swine than is abortus. In summary it may be said that swine are infected with Brucella suis or the porcine type of organism. Cattle are affected with the bovine type and occasionally with the porcine. Gilman and Milks found four strains of Brucella suis out of 117 strains isolated from cow's milk. Others report that 1 to 4% of strains from cow's milk are porcine. Sheep are infected with melitensis and the horse is usually infected with abortus. Sheep can be infected with the porcine type but it appears to be very rare under natural conditions. In regard to sheep and swine we have a very significant condition. In North America where Br. abortus and Br. suis are abundant there is very little infection in sheep. On the other hand, in France, where abortus and melitensis are abundant there is little or no infection of swine. Man, especially mature individuals, are very susceptible to Br. melitensis, less susceptible to Br. suis and still less so to Br. abortus. The severity of the disease likewise runs in this order.
In cows, the application of abortus to the apparently unbroken skin to the conjunctival sac, the teats, the teat canal and the vagina have all resulted in infection. With laboratory animals the same has been repeatedly shown to be so for all Brucella. Feeding regularly infects. With hogs it is known that most, if not all such methods of exposure, will result in infection. The course of the disease is variable. It is believed that the infection ordinarily lasts from about one to six months. On the other hand there are cases that have continued for years. When the infection gains entrance to the body there is a short delay or period of incubation after which the bacteria are carried by the blood and lymph streams to any or all parts of the body, no part of which seems to be especially resistant. The blood stream is not constantly infected with appreciable numbers of organisms but only occasionally so and then usually during the early stages of the disease or at the height of the disease. Between such periods the infection is localized in the various organs. When firmly established in certain regions such as the bones and especially the testicles, infection may persist for many months or years.

The symptoms depend to such a large extent on the part or parts affected that symptoms and lesions will be considered together. Since the blood stream often carries the infection it is reasonable to assume that an occasional febrile reaction occurs. Because swine do not have a uniformly even temperature, slight rises in temperature due to suis infection are almost impossible to detect. On the other hand there are cases on record in the human family where the blood stream regularly carries Brucella organisms without any discomfort whatever to the individual involved. It is reasonable to assume that the same also occurs in hogs. At any rate it should be remembered that many hogs have the disease and recover from it without showing recognizable symptoms. Abortion is one of the symptoms of Brucellosis of swine. However, it is a symptom for which there are other causes. In Iowa the majority of swine abortions are not caused by Brucella. Abortion in Brucella infection of swine resembles abortion in Bang's disease of cattle; infected sows need not abort and perhaps in the majority of cases do not. The incidence of abortions in individual herds is variable. There may be no abortions or only a few abortions. The abortion rate may increase from year to year or it may decrease. It is generally agreed that in the normal sow many ova are fertilized which later die. These develop to various stages so that some die close to term and are delivered as dead pigs at farrow-
ing time. Of course the remainder are born as live pigs. However, in Brucella infection of sows many more of the developing embryos die, and they are usually more nearly developed, so there are a large number of dead pigs in litters from infected sows. The loss from this is nearly as great as that from actual abortion. This character of the disease furnishes a very good example of the hidden or occult damages caused by it. It is thought that the disease has other deleterious effects which are not yet fully recognized. The non-gravid uterus is apt to contain Brucella and in such cases sows may be temporarily sterile. Pyometra is present when the uterus is infected. In one survey about 16% of all pyometra cases of swine were due to Brucella suis. Brucella suis may invade almost any tissue in the body and is often found in large numbers in the lymph nodes, spleen, liver, udder, kidney, testicles and accessory male sex organs and to a less extent in other locations such as the lungs and even the brain. Because of the wide distribution and large numbers of bacteria present the disease may assume an acute form, especially in aged boars. In this there is stiffness, lameness, pain on walking, elevation of temperature, inappetence and rapid loss in weight. Localization in the testicles results in a very severe orchitis, often with necrosis and sterility. Arthritis, bursitis, ostitis, osteomyelitis and inflammation about the joints with resulting local symptoms are often seen in practically all ages of swine. The joints and bones of the legs and spine are especially apt to be affected. Except for the sex organs, bones and joints, macroscopic lesions are rare. Nodules in the spleen similar to those of tuberculosis have been reported. Gross lesions of the liver, kidneys and hepatic lymph glands similar to lesions of caseous lymphadenitis of sheep have been recorded. Brain lesions have been observed. Lesions of the internal organs are usually microscopic in size and heal readily.

Not much is known of immunity. Hogs are naturally resistant to both abortus and melitensis and often show considerable resistance to suis strains. Aged hogs are apt to be more severely affected than the very young, and it is thought that recovery from one attack renders individuals less susceptible to subsequent infection. Hence one would suspect that vaccination of young pigs might be of value, but such vaccination has resulted either in failure or inconclusive evidence. Vaccination of cattle with living cultures of suis produces little or no immunity against abortus. Likewise vaccination of swine with abortus fails to protect against suis strains.
The agglutination test has been employed to eradicate Brucella infection from individual herds of swine. It is used much as in Bang's disease. Reports are favorable. However, a reaction in a low dilution is more significant than in cattle. A reaction in a dilution of 1:25 constitutes a positive reaction and indicates infection in the opinion of the majority. Of course this is subject to all the limitations of the 1:100 reaction in Bang's disease of cattle. Brucella suis has been repeatedly isolated from swine having a reaction of 1:50 and often from those with a reaction of 1:25. Although more work is required, it has been reported many times that Brucella infection can be eliminated from herds of hogs by the application of the agglutination test at short intervals. The agglutination test also serves as a means of diagnosis. In fact some such test or isolation of Br. suis constitutes our only method of diagnosis. Histories, symptoms and lesions are unreliable although helpful. Treatment of affected hogs is not attempted except experimentally and in this all efforts have failed. It has been rightly stated that Brucella infection is a self limiting disease, however, it is seldom that a good sized herd of hogs once infected is ever free of the disease unless control measures are instituted.

Plans for control of infection in swine depend upon a thorough knowledge of the disease and the bacteria that causes it. The procedure employed for the control of infection in cattle can be used almost without change for swine. The infected individual is the main source of danger. In the case of contaminated soil, water, or objects, everything depends on the length of time Br. suis can survive outside the body in these locations. It is believed, with reason, that the melitensis, abortus, and suis organisms are about equal in their ability or inability to survive adverse conditions. All are killed in a few hours when exposed to the sun. It has been impossible to find melitensis in contaminated water or soil after three months and it is safe to assume that the same is true of suis. All are killed by pasteurization.

A consideration of Brucellosis of swine is not complete without mention of its importance to public health. A study of strains isolated from man in Minnesota and Iowa shows that nearly two-thirds are suis, about one-third are abortus and an occasional one is melitensis. There is no question but what suis is more pathogenic for man than is abortus. A study of farms where only cattle or only hogs are affected shows that there are proportionally many more cases of undulant fever on those farms where only hogs are diseased. It is also
well known that cases of undulant fever caused by suis are usually much more severe than those caused by abortus. It is almost impossible to handle carcasses of infected hogs without being exposed. For instance, a single lymph node of an apparently healthy hog may contain several million organisms. At the same time the blood stream and internal organs may be loaded with them. Careful studies in the corn belt show that about half the cases of undulant fever are caused by Brucella suis. In other regions where there are fewer diseased hogs there is less suis infection among people. As mentioned above porcine strains may infect cows and become permanently established in the udders of such animals. Milk from these infected cows is especially dangerous for people. The report of Beattie and Rice is a good example. This outbreak of undulant fever in people occurred at Council Bluffs and was all traced to a few cows in one dairy herd. The cows were infected with a porcine strain. The milk was not pasteurized. The outbreak of undulant fever from these few individuals assumed epidemic proportions.

CONCLUSION

Brucella infection of swine is an insidious disease with many occult characters so that it is impossible to estimate the damage it does in swine. It constitutes a real public health problem. More research work is required on methods of control and eradication. However, if reports already made prove to be without fault, the disease should be as easily controlled as Bang's disease and the returns will be as great.

REFERENCES

Bartram, M. T. 1931—The effect of pasteurizing on (A) Brucella abortus and (B) Brucella abortus agglutinins in milk. Cornell Veterinarian 21, No. 4, pp. 360-387.


Evans, Alice C. 1925—Studies on Brucella melitensis. Hygienic Laboratory Bulletin 143.


Huddleston, I. F. 1923—Further studies on the susceptibility of swine to bovine infectious abortion. Michigan Agricultural College Experiment Station. The Quarterly Bul. 6, No. 1, p. 25.


Thomsen, A. 1934—Brucella infection in swine. Levin und Munksgaard, Copenhagen.


PRESIDENT WESTMORLAND: Dr. McNutt, thank you for your very interesting paper. It will be discussed by Dr. William H. Feldman of the Mayo Foundation for Medical Education and Research, Rochester, Minn. (Applause.)

Dr. Feldman read his prepared paper.
DISCUSSION OF DR. S. H. McNUTT’S PAPER
“BRUCELLA INFECTION OF SWINE”

By William H. Feldman, Rochester, Minn.

Interest in the different infectious diseases like fashions in women’s hats is constantly changing. Four, five and six years ago infections due to Brucella suis were receiving a considerable amount of attention by many different laboratories of veterinary research and the fruits of these studies were reflected in the numerous papers in the current literature. More recently the infections induced by Brucella suis have been crowded out of the limelight as investigators have turned to other and what may appear to be more fruitful fields of research.

However, as any one familiar with the subject well knows, there are a great many questions concerning Brucella suis and the mischief it may due that yet remain unanswered. For this reason Dr. McNutt’s contribution is most valuable and will, I hope, stimulate others to participate in this discussion. Perhaps as a result of his report additional work will be initiated to the end that the problem of infections with Brucella suis will be better understood.

As a pathologist, my interest was first attracted to this subject some five or six years ago by the occurrence of certain vertebral lesions of swine from which my former colleague Dr. Carl Olsen and I succeeded in demonstrating Brucella suis. Similar manifestations of the disease have since been reported by several European workers. To one interested in the morbid changes induced by pathogenic bacteria the variability of the lesions that may or may not be found in swine affected with Brucella suis is indeed unusual. The organism may be secured from apparently normal appearing tissues or as Creech, Thomsen and others have shown, lesions of striking appearance may occasionally be found in the parenchymatous organs, the subcutis, and the tenden sheaths as well as in the lymph modes.

When one realizes the insidious course of the disease produced by Brucella suis, the wide variability in the severity and character of the lesions and the indefinite character of the clinical manifestations of the infection, the difficulty that often arises in making a correct diagnosis in affected human beings becomes evident. The excellent discussion which Dr. McNutt has presented is important not only to the furtherance of a more profitable swine husbandry but also to the epidemiologist and to the physician who are not infrequently concerned
with the disease in human beings. I hope others here will add to this discussion.

PRESIDENT WESTMORLAND: Next on the program will be the report of the Committee on Transmissible Diseases of Swine, by Dr. C. N. McBryde, Chairman.

. . . Dr. McBryde read his committee report.

REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE

DR. C. N. McBRYDE, Chairman, Ames, Iowa.

Dr. H. M. O'Rear, Washington, D.C. Dr. O. S. Crisler, Columbia, Mo.
Dr. Charles Muray, Ames, Iowa. Dr. H. J. Shore, Fort Dodge, Iowa.

Data in regard to the prevalence and relative importance of the principal transmissible diseases of swine were obtained by means of circular letters addressed to federal, state and college veterinarians and prominent veterinary practitioners in the leading swine-raising states, who were deemed to be well qualified to report on these diseases. Replies were received from twenty veterinarians in ten states and the Committee wishes to take this opportunity to thank those who thus kindly co-operated in the compiling of this report by supplying valuable data relative to transmissible swine diseases within their respective states.

Hog cholera continues to be the most important communicable disease of swine. Some areas have reported an increased incidence over last year and others have reported less, and it would seem that, on the whole, the present year may be regarded as an average year as far as this disease is concerned. No severe or widespread epidemics have been reported. More prophylactic vaccination early in the season and the prompt immunization of exposed herds appeared to hold the disease well in check.

The enteric syndrome (acute and chronic enteritis, Suipestifer infection, bloody diarrhea, "pig typhus," etc.) constitutes a very serious loss to the swine raiser and is quite generally conceded to be next in importance to hog cholera. Heavy losses from such infections frequently occur in the juvenile period, in pigs under four months of age. The fact that these infections result from filthy conditions is now quite generally known and their prevention would seem to be up to the swine breeder. If he fails to maintain sanitary conditions, he must expect losses from these infections.

Parasitic infestations and pulmonary infections occupy a position of much importance and are frequently the cause of serious losses. These troubles, however, may be prevented to a large extent by better sanitation on the farm and better housing conditions, and their prevention is likewise up to the swine raiser.

The reports received on swine erysipelas were very variable. It would appear, on the whole, that the acute type of the disease was less prevalent than last year, but more cases of the articular or chronic type were reported in some sections. There appears to be a good deal of confusion in the diagnosis of this disease and it is ad-
mittedly difficult to make a differential diagnosis of the acute type in the field. This difficulty in diagnosis may have given this disease a position of unjustified importance in some instances and further attention should be given to the criteria for its diagnosis.

Nutritional diseases or food deficiencies are another source of loss and are frequently due to lack of adequate knowledge on the part of the swine raiser as to the essential food requirements of swine.

It would seem to be now a well established fact that a number of the more important transmissible diseases of swine are preventable and the best hope for their elimination or abatement would seem to lie in the education of farmers and swine breeders in regard to the importance of early and routine vaccination against cholera and approved methods of sanitation, feeding and housing. If such methods were generally adopted, it is believed that the frequent losses now encountered in swine raising might be eliminated or reduced to a very marked degree. To this end, the committee would again urge, as it did last year, the prosecution of vigorous educational campaigns on the part of state and federal officials and state colleges with a view to the further dissemination of knowledge regarding these matters. This, of course, is a slow method of attack, but continued and persistent effort along this line is bound to bring results in time.

There seems to be no question but that communicable diseases of swine have been and are being disseminated through the medium or agency of so-called "community" or "auction sales." The Committee would again urge a more thorough supervision and regulation of these agencies and endorses the recommendation contained in the paper presented at this meeting by Dr. F. A. Zimmer, State Veterinarian of Ohio, in regard to the veterinary supervision and sanitary regulation of these establishments. Rigid intrastate, as well as interstate, regulations governing the transportation of breeding, feeder and stocker hogs must be put into effect and enforced if progress is to be made in the control of transmissible diseases of swine.

Mr. President, I move that this report be referred to the Executive Committee.

PRESIDENT WESTMORLAND: With the consent of the body we will refer this report to the Executive Committee. Dr. McBryde, we are indeed glad to have you with us again, and your advice and counsel on swine diseases has been of much assistance to this organization.

Next on the program will be a discussion on Unification of Laws and Regulations. The first paper will be "The Desirability of Uniform State Sanitary Regulations Affecting Interstate Shipment of Live Stock," by Mr. John B. Gage, a past President and now a member of the Board of Directors of the American Shorthorn Breeders' Association. (Applause.)

... Mr. Gage read his prepared paper.
THE DESIRABILITY OF UNIFORM STATE SANITARY REGULATIONS AFFECTING INTERSTATE SHIPMENT OF LIVE STOCK

By MR. JOHN B. GAGE, Kansas City, Mo.
Past President, American Milking Shorthorn Breeders' Ass'n.

It is an honor to be asked to address your Association upon a subject of such vital and immediate importance to the live stock industry. Your Association since the year 1925 has been in the forefront of the movement demanding greater uniformity in the state regulation affecting the shipment of live stock. Your views upon this subject had been clearly and definitely expressed in the annual reports adopted at past meetings of this Association rendered by your Committee on Unification of Laws and Regulations. You have pointed out to all state live stock regulatory officials the desirability of "revoking obsolete and unnecessary import regulations in existence in particular states." It has been stated in these resolutions that "a far greater degree of uniformity than now exists in state regulation is desirable and is practical of achievement and in some measure necessary if the confidence of shippers of live stock if the good intent of such regulations is to be won or held." You have directed attention to the fact that the "promulgation of unwise, unnecessary and undesirable laws and regulations hampering the interstate shipment of live stock is likely in the immediate future to cause the existence of even more chaotic conditions" than obtained at the time your resolutions were adopted. The reports of your committees have been specific and, as approved by the Association, have set out in detail proposed forms for uniform state regulations affecting the control of particular live stock diseases, such as Bang's disease or contagious abortion. I say to you now, as one who has a close and intimate contact with the live stock industry, that as a result of the failure of state live stock regulatory authorities to generally adopt your recommendations, the chaotic condition which you forecast is at hand. Despite the respect live stock breeders entertain for the great live stock sanitation work so ably directed on behalf of the federal government under the Bureau of Animal Industry and co-operated in by the state authorities in the eradication of foot-and-mouth disease, the control of Texas fever, and tuberculosis, and other diseases of live stock and poultry, the day is now at hand when, on account of lack of uniformity in state live stock sanitary regulations affecting interstate movement and
trade in live stock, live stock breeders generally, as you forecast, are losing confidence in the integrity and practicability of state live stock sanitary regulations which seek to control interstate shipment. Stockmen, exposed to a great variety of conflicting sanitary regulations respecting shipment of live stock in interstate commerce as promulgated by various states, are rapidly passing from an attitude of watchful, trustful, wishful waiting to one of demanding the abolition of such regulations and the substitution of complete federal control. The only alternative is the prompt establishment by voluntary action of the regulatory authorities of the several states of a condition of substantial uniformity as among the states.

Stockmen generally are believers in states rights. They like to see matters of this kind controlled by authorities with whom they have contact close to home. It is only with reluctance that they would give up and surrender to federal authorities such power. Furthermore, I think most of them would join with me in the view that certain advantages exist in permitting different states and different areas of the country to constitute voluntarily within their own jurisdiction experimental laboratories, so to speak, within which different methods of control or eradication of live stock disease suggested by men of research may be established.

Frequently the individual laboratory experiment, suggestive of good results, does not work out practically in the field. If we permit a certain divergence in the regulations established by different states before these suggested methods of control are applied on a countrywide scale, they can be tested in practice before general application. Uniform control would tend to interfere with the accomplishment of this objective. But this experimentation must be in accord with sensible rules and regulations supported by the general consensus of opinion backed by complete knowledge through previous laboratory test and experiment of the best methods which should be followed in the control and eradication of specific live stock disease. It means the application of the same rule as to the interstate movement of live stock as the state sees fit to apply within its own borders to the intrastate movement of live stock, except as such rules may be modified by valid federal regulation. Only when a state is considered free from a disease prevalent elsewhere can justification exist for differentiation in interstate and intrastate regulations. It means rules that are practical of enforcement and actually enforced without discrimination as to all meth-
ods of live stock transportation into the state. Most distinctly, it does not permit or allow or tolerate the proposition that one rule shall apply to intrastate sales and movements of live stock and another rule much more drastic be also established by state authority to be applied to animals imported to the state from without the state. This is the condition that today obtains in a great many states where the requirements made as to the importation of live stock into the state are most burdensome.

New York requires dairy and breeding animals imported within the state come from herds where 95 per cent of the entire herd has passed a negative blood test within ninety (90) days of the date of shipment, and that each animal so imported has passed a negative retest within 30 days; or that the animals imported come from herds all members of which have within six months prior to the importation passed a negative blood test. Pennsylvania has a stringent but different regulation as to interstate shipment applicable to Bang's disease. Tennessee will not accept bull calves under six months of age unless blood tested. No other state appears to have this specific requirement. Georgia requires steers coming from modified accredited areas be tested not alone for tuberculosis but also for Bang's disease before shipment into the state. Many other states have requirements in regard to imported cattle not applied to the sale or movement within the state of native cattle and which are diverse from and distinctly in addition to the requirements made in the proposed regulations on importation of cattle suggested by your committee and approved by the Association at your annual meeting in 1931.

The restrictions in Pennsylvania have been applied to female cattle brought to the state for feeding, rather than breeding purposes. I can mention many, many other instances of divergencies in these regulations creating uncertainty, hardships, and considered to be unwise and unnecessary by the rank and file of the live stock industry, when we take the country as a whole into consideration, that have sprung into existence within the last several years. We believe them to be unwise and unsound in the present state of our scientific knowledge concerning the control and eradication of Bang's disease.

Science is considered by eminent scientists synonymous with an approach to an exactitude in human knowledge of fact and of method and dependent for its advancement upon the ability to apply accurate tests and measures to natural
phenomena. Exactitude of knowledge as to diagnosis, accurate tests to determine the existence of diseases, definite and generally accepted information as to the method of transmission of disease, are from a scientific standpoint essential to sound regulation for the control and eradication of disease. In other words, the information and tests and knowledge which back up regulations to control animal diseases must be truly scientific in character if they are to meet public acceptance and general approval. It was this characteristic, this scientific aspect of the campaigns to control tuberculosis in cattle or Texas fever that so greatly contributed to the eventual success. It is, in my judgment, the relative lack of this characteristic, this general acceptance upon a factual basis such information as is now available concerning Bang's disease, its diagnosis, its method of transmission and its control and eradication, that has rendered the campaign for its eradication more difficult and less likely to receive general co-operation from breeders of livestock. This is also true with respect to regulations relating to other types of diseases of livestock and poultry. It is not my province in this talk to point out the situation with respect to Bang's disease, or any other disease, from the breeders' standpoint. This, I understand, has been done by other representatives of the livestock industry. All in all, the experience of the breeder, I believe, justifies the statement that it is most unwise to hamper the interstate movement and flow of livestock by the application of interstate movement of requirements of an exceptional nature and character that are not made as to intrastate movement.

Most certainly, the accredited Bang's disease free herds established under the test and elimination method or by vaccination should be protected not only from contamination from other animals brought to the herd from within the state but from those brought without the state. Little or no objection could be made to the establishment generally of regulations such as this association has proposed and approved requiring blood test before shipment.

Our knowledge concerning the methods of control and eradication successfully to be applied as to tuberculosis is scientific, accurate and well established. In regard to this disease it nevertheless appears that state restrictions over the interstate movement of livestock and the character of proof required in various states as to freedom from it, are extremely variant.
Certain states, like New York, Georgia and Alabama, refuse to accept steers originating in accredited areas, as well as dairy and breeding cattle from such areas, unless each individual animal was subjected to the tuberculin test within a certain period prior to shipment. New Jersey requires that bulls, cows and heifers destined for slaughter in New Jersey be tested, except when consigned to certain federally inspected plants. The live stock industry, I believe, can see no justification, in view of the tremendous effort that it has made to establish accredited areas which exist today throughout the length and breadth of the land, except as to certain districts in California, which justifies any restriction or control over the interstate movement of these cattle, except such restrictions and control as are approved by the Bureau of Animal Industry of the United States Department of Agriculture. Breeders and feeders of live stock went to great expense and tremendous effort to comply with the suggestions made by the men who worked under the supervision of Dr. John R. Mohler, Chief of said Bureau, and state sanitary officials, in order to establish accredited areas upon the assumption and with the promise, expressed or implied, before them, if the work was completed, interstate movement would be free from restrictions. This promise is not being carried out and there is no justification, as we see it, for the imposition by any control or restriction on the ground of the existence of tuberculosis which is not established as controlling over the interstate movement of live stock by the Bureau of Animal Industry.

In regard to the control and eradication of pullorum disease in poultry, we find that the restrictions imposed by various states are quite variant. Some states would require that all baby chicks shipped into those states be from accredited pullorum disease free flocks. The agglutination test to establish the existence of pullorum disease, or its non-existence, in poultry has been in use since 1913. While it has been definitely established that positive reaction may occur in many birds not affected by the disease, under certain particular conditions of feed and health, the test is, nevertheless, a valuable one, as in the case of Bang's disease. The question as to whether or not regulations in the form existing in such states as Idaho, Arkansas and other states, which prohibit shipments to the states of chicks not produced from tested flocks should be maintained is debatable. But that such states should apply the same regulations to intrastate sales of chicks as to interstate sales of chicks by hatcheries is undebatable.
In the case of Reid vs. Colorado, 187 U. S. 137, 47 L. Ed. 108, the basic case upon which the authority of states, as well as the federal government, to regulate the interstate transportation of live stock rests, the Supreme Court upheld regulations of the State of Colorado in regard to the importation of tick infested cattle or cattle subject to tick infestation into that state. It broadly sustained the authority of the state, despite the federal statutes establishing the Bureau of Animal Industry and authorizing it to establish regulations in relation to interstate commerce transportation, to also apply regulations not inconsistent therewith in the interests of the state itself. The Court said:

“Our conclusion is that the statute of Colorado as here involved does not cover the same ground as the Act of Congress, and, therefore, is not inconsistent with that Act; and its constitutionality is not to be questioned unless it be in violation of the Constitution of the United States, independently of any legislation by Congress.”

The Court then proceeded to hold that the Act of Colorado was not unconstitutional. In closing the opinion, the Court made this significant statement:

“One other objection to the Colorado statute must be noted, namely, that it is inconsistent with the clause of the Constitution declaring that the citizens of each state shall be entitled to all privileges and communities of citizens in the several states. This position is untenable. The statute is equally applicable to citizens of all states. No discrimination is shown. No privileges are granted to citizens of Colorado that are denied to citizens of other states.”

It is, therefore, important from a legal viewpoint that regulations which states impose restrictions upon the import of cattle or other live stock into the state be consistent with regulations imposed upon the movement of cattle or other live stock within the state. In other words, the idea that drastic regulations on importations from other states of live stock made under the guise of sanitary regulation, can establish sort of an economic tariff or barrier against such importation is very likely to lead to court decisions striking down into all of such restrictions.

In the so-called Wisconsin-New York case (Mintz v. Baldwin, 289 U. S. 346, 77 L. Ed. 1245) the Supreme Court upheld the validity of regulations put in effect by the State of New York prohibiting the shipment from other states to New York of dairy and breeding cattle over six months of age which did not come directly from herds certified to be free from Bang's disease by the chief live stock sanitary official of the state of origin, such animals to be accompanied at the time of import by a certificate authenticated by such live stock sanitary official showing the name and address of the labora-
tory or person making the last blood test on such herd, with a complete statement of the result of such test on the animal so imported.

The objection made to the validity of this regulation by the plaintiff in this particular case was that the order of the chief sanitary official of the State of New York was in conflict with the federal statutes relating to the interstate transportation of live stock. No objection was urged on the ground that the same was not applied as to the movement and sale of local live stock or to the sale of live stock by citizens of the State of New York. The Court in holding that there was no conflict between the present federal statutes and the order of the State of New York said:

"Plaintiff's cattle were not inspected by, and no certificate was issued under, federal authority. Unless the Act itself operates to prevent the enforcement of the order the suit was rightly dismissed. The express conclusion of state inspection extends only to cases where federal inspection has been made and certificate issued. The clause cannot be read to extend to other cases. The expression of purpose so to limit the exertion of state power strongly suggests that Congress intended not otherwise to trammel the enforcement of state quarantine measures. Much weight is to be given to the practical interpretation of the Act by the Federal Department through its acquiescence in the enforcement of state measures to suppress Bang's disease."

The court then distinguished the case of Oregon-Washington Railroad and Navigation Company v. Washington, 270 U. S. 87, 70 L. Ed. 482, by stating that "in the other case the plant quarantine act covered the whole field of regulations so far as the spread of plant diseases by interstate transportation could be affected or restrained." It is thus apparent that a slight extension of federal authority in regard to the interstate transportation of live stock and the prevention of the spread of disease through such transportation or a slight extension by the Secretary of Agriculture of the exercise of powers given him under existing statutes would render invalid practically all state regulations of restricting the movement of live stock into such states from other states.

This Association has in the past proposed that unification of state laws and regulations be accomplished by providing that they shall be valid and enforceable only after approval by the Secretary of Agriculture. This, of course, would be one method of handling the situation, but it is self-evident that the Secretary of Agriculture, for political reasons and otherwise, might find it distasteful to take upon himself the exercise of authority conferred in that fashion. It would doubtless be much simpler to get legislation through Congress.
giving paramount authority to the Secretary of Agriculture, as under the original Plant Quarantine Act.

State regulatory authorities should bear it in mind that not only do non-uniform, unwise, unnecessary or unwarranted restrictions on interstate movement of live stock as distinguished from intrastate shipment or sale impose hardships upon farmers residing in the state which establishes such regulations, but that they imperil from a legal standpoint the entire structure of state live stock sanitary regulation. The only result of such regulations will be to compel complete federal control of live stock sanitation insofar as it is affected by interstate transportation and abolition of all state authority in that field. The live stock industry may be forced to that alternative, but it hopes that state control may be continued under sound, sensible regulations, as simple and as uniform as it is practical to make them under the different situations that arise in the different states. It is in the light of that wish and desire and to assist in reaching that objective that I take this opportunity on my own initiative and responsibility of making the following suggestions, imperfect though they may be in both content and scope, I feel that their adoption would go far to restore the confidence of the rank and file of live stock breeders in the efficacy of state live stock sanitary regulations affecting interstate shipments.

1. As to regulations designed to protect against tuberculosis, Texas fever, and foot-and-mouth disease in cattle; against glanders in horses, and against pullorum disease in poultry, state regulations should conform to the B. A. I. regulations. These have been drafted by capable and experienced men for the sole purpose of controlling and eradicating these live stock diseases. As to these diseases state regulations should go no further than the existing federal regulation. If origin in modified accredited areas is sufficient for the B. A. I. it should satisfy state authorities everywhere.

2. As to Bang's disease, the import restrictions established by states should presently go no further than the restrictions recommended in the form of uniform regulations by the report of your Committee on Unification of Laws and Regulations of this Association approved by the Association in 1931. All extra, superficial regulations such as the testing of range steers for tuberculosis and Bang's disease or the testing of cattle brought into a state wholly for feeding or slaughtering purposes should be abolished, as well as the re-
requirement of some states that imported animals must come from accredited herds.

3. Forms for reporting the existence of conditions permitting import of live stock should be standarized as among all states and greatly simplified. Duplicate reports where now required should be eliminated. I have particularly in mind requirements that demand where live stock is shipped from public federally supervised markets into a state, not only the Federal Form 48B, but also a certificate from state regulatory officials. The information in F. I. Form 48B, which is furnished by federal authorities at supervised markets, duplicates that contained in the certificates issued by the states. The Bureau of Animal Industry representative will send this report to all state regulatory officials who desire the information. To require a duplicate report giving the same information simply burdens the industry without just cause or excuse.

4. Rules such as in Wisconsin which require buyers of feeder cattle to obtain a permit in order to get a permit should be changed. In certain states the buyer is required to first get a permit from a county official in order to obtain one from the state veterinarian. This is burdensome and serves but to irritate the stockmen. Investigation of the prevalence of animal disease in given areas within states shows that there is apparently less tuberculosis and Bang's disease on the whole in those particular areas in states where a large number of imported cattle are fed for market than in other areas. Therefore, the refusal of such states as Kentucky, Iowa, Minnesota and Oklahoma, to accept federally certified accredited range cows of the beef breeds for feeding purposes, unless such cows pass all tests required of dairy and breeding cattle, is unwise and such restriction should be eliminated.

5. The rules in relation to blood testing for Bang's disease should be standardized as among all the states in the application of their requirements for importation of cattle by requiring the use of standard antigen and that blood taken by federally or state accredited veterinarians be tested in accepted laboratories; that the period within which the test shall be made prior to shipment and the age and sex of the live stock to which it must be applied be the same as to all states; and that the rule as to the dilution in which the negative reaction must appear be uniform in all states as to imported live stock.
6. No state regulation should be put into effect which is not susceptible of actual and thorough enforcement as to all methods and modes of transportation and to all live stock whatever may be the origin and ownership of the shipment. It is most unfair that railroad carriers and federally inspected stockyards who advise state authorities in advance of incoming shipments so that those officials may have ample opportunity to take necessary measures should meet competition of truckers who do interstate hauling and feed yards which do not report shipments, and in respect of which the enforcement of restrictions cannot be practical or effective. There are instances now wherein state officials will regularly issue permits for shipment in apparent violation of their own regulations. This action destroys the confidence of those who have to comply with the regulations. It should be discontinued and the regulations in question either abolished or enforced.

In conclusion, may I say, that many of the state restrictions, which by reason of non-uniformity with those of the B. A. I. or other states or because of their drastic character, meet the greatest objection, are born of a sincere attempt to force developments too rapidly and in advance of the settled and accepted scientific knowledge of the subject matter. They ignore the great advantages which results from freedom of interstate movement of live stock—an advantage to the consumer of live stock products as well as to the live stock breeder and feeder.

Again I commend the work of your committee, but warn you that recommendations committed to paper but thereafter ignored will be unavailing to stem the rising tide of opposition. Let us hope that action will replace words and that the future of live stock sanitary regulation in this country may be as full of achievement as the past.

PRESIDENT WESTMORLAND: Thank you, Mr. Gage. We are happy to have this subject discussed from the standpoint of the cattle men. We will now have a discussion of this paper by Mr. L. M. Rexton, Assistant General Manager, Denver Union Stock Yards, Denver, Colo. (Applause.)

MR. L. M. PEXTON (Colorado): Mr. President and Gentlemen:

I want to take just a very few minutes of your time, because Mr. Gage has covered to a more or less extent what I wish to say. I simply wish to call your attention to the ap-
parent trend of permitting shipments to move around the central markets without any restrictions whatever, while at the same time if they should happen to be bought at or moved through the central markets, restrictions are put on the live stock which we feel result in diverting a great deal of live stock away from the central markets, to the detriment of the live stock industry because of sanitary regulations.

As you all know, disease of live stock became less and less down through the years while the majority of the movement was through central markets. The success of the various state organizations and the Bureau of Animal Industry was almost phenomenal in the eradication of tuberculosis, of tick fever, hog cholera and other diseases. Up to a very few years ago, it seemed that we were getting along fine, and that we in America could look forward to practically complete elimination of live stock diseases.

During the past five or six years the trend has been in the other direction, as some of the other speakers have pointed out—that community sales have undoubtedly spread much disease. There has also been the trend of permitting shipments to move around the markets; for example, various states have provided and promulgated regulations which provide that if shipments are not handled in central markets, dipping is not required, whereas in central markets dipping is required.

Of course, it entails expense to dip live stock anywhere. We do it in our market substantially below cost over a period of a year, yet it does cost something. Our rate is $15 a car. If a man can escape paying it—and a great deal of this is in the hands of traders and others who are often willing to waive what might be a necessary requirement in order to secure more profit for themselves; if they can avoid the markets naturally they are going to do so. Their interest is in making a profit, not necessarily in providing the cleanest live stock they possibly can to their customers.

I know specifically about Denver and Ogden, and also about the federal yards in Wyoming which we operate. I have a general knowledge about the other livestock markets. I know that we thoroughly clean and disinfect all of our stockyards, whether we have any infection or not, at least once a year. If we do have infection, whether it is black leg, scab or anything else, all of the premises on which that stock may be handled is immediately thoroughly cleaned and disinfected. We do everything we can to see that the people who use our stockyards, or who may buy live stock there, will
get live stock that is satisfactory to them. That should be our endeavor, because we expect to be in business from now on, and that is quite a while, gentlemen, at least for the next hundred years, and all of our actions are controlled that way.

We realize only too well that if a man comes to one of our markets and buys live stock which later develops an infection, which apparently was contracted at our yards, he loses confidence in our market, and is less likely to come back. In other words, we have every incentive in the world to give the feeder, the people buying at our market, a good product, one with which they will be satisfied.

On the other hand, in the operation of a feed yard—where the only profit is from the sale of hay—obviously you cannot do the things you should; you have no inspection of any kind, you do not have paved pens which are susceptible to efficient cleaning and disinfecting; there are no requirements that this be done every year. If we should get infected live stock at some of these points we would not know it. Our spirit might be right, but our knowledge would be poor, and naturally the infection would spread among everything that came through there.

So far as dipping lambs is concerned, personally I believe it is a good thing. If I were going to feed lambs myself I would want them dipped for no other reason than to kill the ticks, yet if shipments move through our markets dipping is required, but if they avoid it, it is not required in some cases.

I just want to call these to your attention more on account of the trend, perhaps, than any specific condition, because it does seem to us, as I have said, that various states are operating against their best interests. They are favoring the points where disease may be spread and where no efforts whatever are being made to control it, where the live stock industry is not co-operated with, and are penalizing points that are really trying to co-operate not only with the state but with national regulations, and have tried to be of such assistance as they can.

If I were a sheep producer in the west, and had scab in my flock, I would not ship them to a central market, because I know that 99 times out of 100 they would be caught. I would try to move them through one of these feed yards where I know they would not be caught, and where some of the states are not requiring any dipping whatever to be done, on the theory that the animals are clean.

If I had good, clean stock I would just as soon send it to a market. Your actions in the past are creating some of the
conditions that Mr. Gage has brought out so forcibly to you. You see an increasing trend in live stock diseases; therefore, you feel that you must do something. But in many cases your actions have been such that you will spread disease even more, rather than control it. I do not think there is any better way in which you can control these diseases and stop them than by pushing and forcing traffic to go through central markets.

We do not want to dictate your regulations to you. If you feel it desirable to dip all the lambs coming into, a certain state, we will be the last ones in the world to object. That is strictly up to you. You are familiar with your local requirements, and we want you to do what is necessary; but whatever you decide, make it unanimous. Do not leave one point out and keep another point in.

Thank you. (Applause.)

PRESIDENT WESTMORLAND: Thank you, Mr. Pexton, for your remarks.

The next on the program is the report of the Committee on Unification of Laws and Regulations. This has been already referred to the Executive Committee, and will come up later.

Next is the report of the Special Committee on Uniform Interstate Certificate Blanks, by Dr. William Moore, Chairman.

REPORT OF SPECIAL COMMITTEE ON UNIFORM INTERSTATE CERTIFICATE BLANKS

DR. WILLIAM MOORE, Chairman, Raleigh, N. C.

Dr. W. J. Butler, Helena, Mont. Dr. Chas. E. Cotton, St. Paul, Minn.
Dr. E. T. Faulder, Albany, N. Y. Dr. F. A. Zimmer, Columbus, Ohio.

DR. WILLIAM MOORE (North Carolina): Mr. President and Gentlemen:

Your Committee has carefully examined the health certificate blanks now used by the several states, and finds that there is a great lack of uniformity as to size, form, etc. We also find that there is a desire by most if not all live stock sanitary officials to correct this condition.

After due consideration we recommend:

1. That the certificate now used by the State of Iowa with the omission of the space used for reporting the subcutaneous tuberculin test and the addition of a space showing the status as to Bang's disease be adopted by this Association as a uniform health certificate for the interstate shipment of all live stock. (Copy attached.)

2. That all states conform to this certificate whenever it becomes necessary for them to print a new supply of certificates, and that they be made in quadruplicate and serially numbered and issued in accordance with B. A. I. regulations and the regulations of the state of destination.
I hereby certify, that I personally tested with (tuberculin) (mallein) the above described animals and this is a correct statement of the results obtained.

THE FOLLOWING TO BE FILLED OUT ONLY FOR INTER-STATE or INTRA-STATE MOVEMENT OF LIVE STOCK: I hereby certify that ......... animals showed typical reaction and were taken out of this lot; and I further certify that the above animals are free from symptoms of contagious, infectious or communicable diseases. I hereby certify that ......... animals showed typical Bang's reaction and were taken out of this lot.

Signed........................................... Address........................................
by the State of Montana, known as S. V. Form 10, revised copy attached, to be printed and issued in triplicate and serially numbered.

S.V. Form 10.

MONTANA
LIVESTOCK SANITARY BOARD
HEALTH CERTIFICATE

This is to certify that I have this day examined originating in the

Species and Class
County of ..................................State of Montana
owned by ..................................from .................
consigned to ..................................at .................
to be fed in transit by ..................at .................
loaded at .................. shipped { via .................
trailed { and that to the best of my knowledge and belief animals in this shipment are free from contagious disease or exposure thereto.

Approved Deputy State Veterinary Surgeon

Address

ORIGINAI.—To Accompany Shipment.

I move that this report be referred to the Executive Committee. (Applause.)

PRESIDENT WESTMORLAND: Dr. Moore, we are really glad to receive this report, because it has been anticipated for several years, and I am sure it meets with the approval of this organization. Without further comment the report will be referred to the Executive Committee.

Gentlemen, the meeting is adjourned for lunch.

. . . The meeting adjourned at 12 o'clock noon.

ADJOURNMENT

THURSDAY AFTERNOON, DECEMBER 1, 1938

The meeting convened at 1:30 o'clock, President D. E. Westmorland, presiding.

PRESIDENT WESTMORLAND: Gentlemen, the meeting will come to order.

The first speaker this afternoon will be our friend, Dr. J. S. Koen, of the Bureau of Animal Industry, Storm Lake, Iowa, who will discuss "Some Phases of Meat Inspection." (Applause.)

. . . Dr. Koen read his prepared paper.
Without an adequate supply of wholesome, nourishing food, no nation can long survive. Civilians and soldiers alike require good food in ample quantity if they are to perform with maximum efficiency. During the World War this fact was constantly stressed. In peace times we all realize that food preserves the nation. In each instance—meat—is a dominant item of the food supply. With these facts before us, it behooves this association to give serious consideration to our meat supply.

To produce an adequate quantity of meat our live stock must be protected against animal diseases and parasites. The active membership of this association comprises the officials of the various states, you and you, and you, whom I now address. The public expects that only meat known to be wholesome in all respects will be offered for human consumption. The needed and much to be desired assurance can be obtained through various veterinary services including efficient meat inspection.

Are we measuring up to our responsibilities in giving to the owners of live stock the maximum protection against animal diseases and parasites? Have we grasped our opportunity to give the people sound, clean, wholesome meat? Let us consider the essential facts in the case. Federal meat inspection provides the desired assurance for about two-thirds of the total supply, namely, for the products of establishments that conduct an interstate or foreign business. In the case of much of the remaining intrastate business the situation is not so satisfactory. Only one state, California, has a system of meat inspection in extended operation. The officials of that state deserve much commendation for the progress they have made in the development of their state meat inspection system. It offers a concrete example to any state desiring to engage upon a project of meat inspection. Three years ago there were a dozen state officials considering a system of inspection for their states. To date we have heard of none of them adopting one and putting it into operation. Some action has been started in a few states but as a whole it appears that little specific progress has been made.

An official of one of the states that has stressed local inspection wrote me three years ago in part as follows: "Only a small number of our cities, listed as county seats of our
counties, have meat inspection service, and under these conditions, we must conclude that the veterinary profession of our state has a very fertile field for future developments and a wonderful opportunity to render an important and effective service. This fact is the more forcibly presented to us when we realize that we have 264 slaughtering establishments where no inspection exists other than certain sanitary requirements." Three years have passed and so far as we can learn the same conditions exist and the same opportunities are presented. Similar conditions exist in other states. The more serious conditions are, the greater the opportunities for regulatory and health officials.

In behalf of your committee on meat and milk hygiene it is my object today through this discussion to emphasize your responsibilities and to point out the opportunities that are yours for greater public service. I refer to the advancement and preservation of the livestock industry, and the protection of both animal and human health by establishing in your state an adequate system of meat inspection as a supplement to federal inspection so that there may be supervision over all meats and meat food products.

Reluctantly, I refer to my own close contact with this problem. Some of you know that from personal experience I can understand the difficulties that do or will beset you if and when you undertake action contemplated by this discussion. Furthermore, you will appreciate that my remarks are made, not in a spirit of criticism but sincerely as constructive suggestions.

PURPOSES OF MEAT INSPECTION

The Bureau of Animal Industry has stated that the purposes of meat inspection are substantially as follows: To destroy for human food purposes diseased and unfit meat; to require that the preparation and handling of food composed wholly or in part of meat be conducted in a sanitary manner; to prevent the use in meat foods of harmful substances; to require the application of the marks of inspection to inspected products; and to prevent false and deceptive labeling or misleading statements in connection with meat foods.

In presenting a picture of meat inspection in the United States, it is necessary to give several views to make the picture complete. One represents that portion of the nation's meat supply that is prepared under adequate meat inspection. In this view we have about 70 million animals that are slaughtered annually under the supervision of the U. S. Bu-
reau of Animal Industry. To this number should be added those animals slaughtered under good state and municipal inspection and under the Veterinary Corps of the War Department. The total of all meat prepared under adequate supervision represents a figure somewhere between two-thirds and three-fourths of the entire meat supply for the Nation.

The benefits derived from adequate meat inspection may be summarized as:

1. Protection to the public against diseased and unfit meat. This protection is a proved investment in better health for the general public.

2. Protection to the live stock industry through information furnished it concerning the location of communicable animal diseases. This information is of demonstrated economic importance to the live stock industry. The records compiled under meat inspection furnish vital statistics for animal diseases control work that is most helpful to regulatory officials and the public.

The results of inspection are published by the Bureau in convenient summarized form and thus are available to all persons interested. There are about 800 veterinarians employed full time in meat inspection by the Bureau of Animal Industry. The high standing and efficiency of meat inspection as conducted by this Bureau represents a great veterinary achievement.

For the sake of emphasis may I repeat what has been stated so often in your hearing at previous meetings. Our nation cannot exist without live stock; live stock cannot thrive and return profits to the owners if menaced by animal diseases and parasites; animal diseases and parasites cannot be controlled and eradicated without trained veterinarians.

The practicing veterinarians stand as sentinels in their communities, ever alert and watchful to detect the earliest symptoms of infectious and contagious diseases of live stock, and to combat the attacks of parasites. The state and federal field veterinarians, under the able direction and supervision of regulatory officials, under the control and eradication of such diseases. Yet how often has it happened that the veterinarians on meat inspection have been the first to detect the presence of these diseases and by tracing the diseased animals to the point of origin have furnished to regulatory officials and farmers, the first evidence of infection on the farms. Thus warned, the farmer is able to combat and
overcome the infection or to rid his premises of the disease through control measures under your direction.

Another phase. Local veterinarians and field inspectors, through the scientific tests now employed, detect and remove from the herds the reacting animals. These animals are sent to market and slaughtered under meat inspection. The extent or severity of disease processes are efficiently measured, the fitness or unfitness of meat for food purposes is determined, the diseased or unfit carcasses and parts are condemned and destroyed, and the carcasses and parts found free of disease and fit are passed. The salvaging of reactor animals found to be fit for human food at slaughter has been made possible through public confidence in federal meat inspection.

It is fitting that we point out certain special qualifications needed by a federal veterinarian engaged in meat inspection. Meat inspection is a highly specialized service, the intricacies of which are little known except by those actually engaged in it. It requires greatly diversified training and experience. To be able to perform and direct meat inspection, one must first of all be a graduate of a recognized accredited veterinary college. His training includes a knowledge of pathology, bacteriology, chemistry, and allied sciences. He must be familiar with structural, mechanical, and sanitary engineering. It is his province to judge professionally whether meat is healthful and wholesome and whether it has been prepared under hygienic conditions. This requires training, experience, skill, and integrity.

I mention this personnel phase of federal meat inspection to acquaint state and local officials with the considerable experience that is available for counseling you, should you decide to pattern your own inspection after the federal system.

Supplementing the U. S. Bureau of Animal Industry meat inspection is the inspection of meat by the Veterinary Corps of the War Department. I requested Lieut. Col. Jesse D. Derrick, V. C., U. S. Army, Headquarters Seventh Corps Area, Omaha, Nebr., to prepare a brief statement relative to Army service which he kindly did and which I now offer.

MILITARY MEAT AND DAIRY INSPECTIONS

Officers of the Regular Army Veterinary Corps are responsible to the commanding officers of their stations for the conduct of the meat and dairy inspection service of the command. Veterinary officers co-operate with purchasing and contracting officers in the preparation of invitations for bids which are furnished only to establishments previously in-
spected and approved. Meats and meat products, with the exception of poultry, are accepted only from plants operating under the supervision of the U. S. Bureau of Animal Industry. The sanitary standards of this agency are not questioned. Inspection for acceptance is made at points designated in invitations for bids and is normally accomplished at receipt. Factors considered are type, class, grade, condition, and evidence of prior inspection. Items must be properly packaged and delivered in an approved manner. Where necessary, refrigerated delivery is required. This inspection insures that the terms of contracts and the provisions of applicable army regulations and federal specifications are complied with and that the government gets what it pays for.

Pastuerizing plants and dairy farms are given a rigid inspection at least once monthly. Any establishment may be eliminated at any time sanitary requirements are not met or for failure to make proper delivery. In such cases, open market purchases from approved sources are made for the remaining contract period, any excess cost being charged against the original contractor. Pasteurized milk in bottles is required. Delivery of raw milk or bulk milk is prohibited except by special authority of corps area commanders in an emergency. Such authority is rarely given.

Veterinary inspections for the Civilian Conservation Corps are conducted along similar lines and are governed by the same regulations and, in addition, War Department CCC regulations which provide that certain approved packing houses not under the supervision of the U. S. Bureau of Animal Industry may furnish meat items. During the early days of the CCC, local markets and plants where federal inspection was not maintained were an important factor. It was thought impossible to make delivery of federally inspected meats to isolated camps. Veterinary inspection of items from these sources was practically impossible. The army veterinary service, in co-operation with sales officers, has provided for inspection at source in the principal packing centers. It is now possible for army veterinary officers to select and stamp from 90 to 100 per cent of all meat items which are delivered to camp sites by packers. Source of inspection is also coming into practice for regular army overseas contracts. The value of meat and dairy items inspected annually by the army veterinary service for the regular army and CCC during the past five years has approximated 50 to 55 million dollars, or a quarter of a billion for the period. Hence the importance of this service.
The army veterinary corps, in addition to the performance of its normal duty, has been responsible for marked improvements in connection with meat and dairy hygiene. Furthermore the public, through the corps' activities, has become more "inspection conscious." The high standards maintained by this corps have resulted in the elimination of large numbers of undesirable meat contractors operating without federal inspection. Such action is therefore definitely in the interest of legitimate packers operating under the supervision of the U. S. Bureau of Animal Industry. The influence of large numbers of CCC boys who have benefited from veterinary educational programs is certain to have a constructive effect on the conduct of municipal, state, and federal meat and dairy hygiene services.

THE PROBLEM OF UNINSPECTED SLAUGHTER

Another view of meat inspection in the United States is not so bright. However, it is the one that concerns you most. It is the picture of about one-fourth of the nation's meat supply that is prepared under inadequate inspection or without any. It is estimated that about 30 million animals are slaughtered annually without the benefit of adequate supervision. This meat is certain to include some diseased and unwholesome products and a considerable part is not handled and prepared under hygienic conditions. It is a distinct liability to public health. It affords no information to the livestock industry concerning the location of animal diseases and parasites. In many instances the presence of diseased meat is concealed, thus hiding the signs of danger. Lack of inspection and supervision in handling this uninspected meat output becomes a liability to the livestock industry and retards and obstructs the animal disease control efforts of the regulatory officials.

We have good reason to believe that a higher percentage of animals slaughtered without inspection should be condemned than is condemned in animals slaughtered under federal inspection. Even a like percentage would mean that more than 160,000 carcasses should be condemned annually. There are no records available to indicate that any considerable portion of that number was actually condemned and the carcasses destroyed. It is reasonable to assume that a vast amount of diseased, unsound, and unclean meat is actually sold for human consumption because there is no efficient inspection of it.
A carefully conducted survey over a period of two years of plants operating in the United States without the benefit of adequate meat inspection revealed 400 cities having some form of local inspection, most of which was superficial or poorly applied. About 1,500 plants are known to be operating without any form of inspection. We believe there are probably twice that number without supervision of any sort.

To secure (1) adequate inspection at time of slaughter over the 30 million animals and supervision over the 1,500 to 3,000 plants operating without inspection of any kind, and (2) to raise the standard of inspection in those plants now operating under makeshift inspection, constitute the problem for consideration today. It is a real problem for regulatory officials of the several states, for directors of public health of states and cities, for veterinary, medical, and live stock associations, and for the general public. The public is not fully unaware of the problem, which stands as a challenge to this association. It also stands as an opportunity to you for distinctive and constructive public service of the highest order.

What are you going to do about it?

PRESIDENT WESTMORLAND: Thank you, Dr. Koen.
The next paper is, "A Microscopic Test for Quality Milk," by Dr. C. S. Bryan, Michigan State College, East Lansing, Mich. (Applause.)

A MICROSCOPIC TEST FOR QUALITY MILK

Michigan State College, Division of Veterinary Science

The efforts put forth to produce milk and milk products that are safe and that meet reasonably high standards of quality must be extended in at least two directions: (1) to determine the health of the cow, and (2) to determine the cleanliness of the cow and her surroundings in addition to the construction and care of the equipment that is used in handling the milk before it reaches the consumer.

1. HEALTH OF COW

State laws universally define milk as the normal lacteal secretion of one or more healthy cows. The interpretation of what constitutes a healthy cow may be variable but we are certain that the germs of at least three dairy cattle diseases can be transmitted to humans through milk and
cause distress in people. These diseases are: tuberculosis, Bang's disease and streptococcic mastitis. The tuberculosis of dairy cattle in the United States has been reduced to insignificant amounts in all but one state, and along with the reduction of tuberculosis in dairy cattle the milk-borne tuberculosis in children has disappeared. Bang's disease is being attacked in an effort of eradication similar to the tuberculosis campaign. In Michigan the percentage of reactors to the agglutination test for Bang's disease is about three times the number that reacted to the tuberculin test. This increased incidence of Bang's disease makes the campaign of eradication a larger one than was the campaign for the suppression of bovine tuberculosis.

Mastitis is an inflammation of the mammary gland and may be non-infectious or of the infectious type. Approximately 99 per cent of all mastitis affecting dairy cattle is of the infectious type with over 99 per cent of the infectious type caused by the streptococcus group of bacteria. The mastitis, therefore, is called streptococcic mastitis with Streptococcusagalactiae causing about 95 per cent of all streptococcic mastitis. The results of several tests or examinations that are valuable in checking cows for streptococcic mastitis to determine the presence or absence of the streptococci in the milk and the presence or absence of induration in the udder are presented in Table I. The microscopic tests (microscopic examination of properly collected milk samples incubated at 37 degrees Centigrade for at least twelve hours)

**TABLE 1**

<table>
<thead>
<tr>
<th>Test</th>
<th>Percentage of positive cows giving a positive reaction on any one test</th>
<th>Percentage of negative cows giving a positive reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microscopic</td>
<td>99</td>
<td>0</td>
</tr>
<tr>
<td>Blood agar plate</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>Physical exam. of udder</td>
<td>61</td>
<td>10</td>
</tr>
</tbody>
</table>

at any one examination detects an average of 99 per cent of all infected cows with none of the cows without mastitis giving positive test results. This test therefore is just as accurate in diagnosing this infectious disease as is the tuberculin test in tuberculosis or the agglutination test in Bang's disease. The blood agar plate detected only 90 per cent of the infected cows at any one examination. The factor of dilution, medium, pH
and so forth are responsible for not detecting the streptococci in blood agar plate. In some cows induration of the udder may be detected within a few days or weeks while in other cows the abnormalities may not be evident for a year or more but always do occur following a positive microscopic test which includes finding the streptococcus in the milk. Therefore, in checking any cow or herd for streptococccic mastitis it is advisable to make physical examination of each udder to determine the extent of pathological changes that have taken place and to apply the microscopic test to properly collected milk samples of each lactating cow to locate the infected cows. The importance of a dairy cattle disease is determined partially by its incidence.

**TABLE 2**

Summary of the total number of cows tested; percentage of streptococcic mastitis infection among cows tested.

<table>
<thead>
<tr>
<th></th>
<th>Total tested</th>
<th>Total not infected</th>
<th>Total infected</th>
<th>Percentage of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herds</td>
<td>322</td>
<td>45</td>
<td>277</td>
<td>86</td>
</tr>
<tr>
<td>Cows</td>
<td>2715</td>
<td>2003</td>
<td>712</td>
<td>26.2</td>
</tr>
</tbody>
</table>

Upon checking 2,715 cows in 322 herds (Table 2) of a typical milk shed employing the microscopic test and physical examination of the udder, 86 per cent of the herds were found to have streptococcic mastitis and 26.2 per cent of all lactating cows were infected. The size of herd did not influence the incidence of infection for some small and some large herds had either high or low incidences of infection. The large amount of infection in some herds suggests an inquiry concerning the portal of entry of the streptococcus into a cow’s udder.

Accordingly, six cows free of tuberculosis, Bang’s disease and streptococcic mastitis were successively exposed for one month each to a culture of *Streptococcus agalactiae*, by feeding subcutaneous and intravenous routes, dipping the uninjured teats into the culture and dipping the injured teats. Four of the cows became infected as a result of dipping the uninjured teats; one following dipping of the injured teats, and one became infected as a result of natural exposure to the infection in the barn (Table 3). The interference with function of the udder by the streptococci results in altered composition and quality of the milk produced. The consumer determines the desirability of a product largely by flavor and
appearance. A comparison is made of the flavor quality of milk from non-infected and infected cows in Table 4.

**TABLE 3**
The portal of entry of the streptococcus into the cow's udder as indicated by either infection or no infection following experimental exposure.

<table>
<thead>
<tr>
<th>Month of Study</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of Exposure</td>
<td>None</td>
<td>Fed</td>
<td>Subcutaneous</td>
<td>Intravenous</td>
<td>Dip Tests</td>
<td>Injure Tests</td>
<td>Dip Tests</td>
</tr>
<tr>
<td>G 1935-'36</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>H 1935-'36</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1 1936-'37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2 1936-'37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Gt (Control) 1935-'36</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+1</td>
<td></td>
</tr>
<tr>
<td>3 (Control) 1936-'37</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Legend: + = infection; — = no infection; O = no experimental exposures.

1. Control of 1935-'36 remained negative throughout period of exposure of the two experimental cows, after their infection the control cow was exposed by dipping the teats.
2. Control of 1936-'37 became infected as a result of exposure to the streptococcus due to being stabled in the same barn with the experimental cows.

**TABLE 4**
A comparison of flavor quality of milk from non-infected and infected cows.

<table>
<thead>
<tr>
<th>Udder infection</th>
<th>Samples scoring</th>
<th>Average flavor score*</th>
<th>Criticized as &quot;salty&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18-20</td>
<td>21-25</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14.8%</td>
<td>85.2%</td>
<td>21.2</td>
</tr>
<tr>
<td>Streptococcic</td>
<td>71.0%</td>
<td>29.0%</td>
<td>18.82</td>
</tr>
</tbody>
</table>

* Organoleptic tests were made by Dr. Trout of Michigan State College. Perfect score is 25.

These results covering a period of time during which the milk of both infected and non-infected cows was scored, reveal that samples from infected cows were criticized as being salty in 62.7 per cent of the cases and in only 14.8 per cent of the cases when the milk was from a herd which did not have
any mastitis present. The cows of the negative herd giving a salty flavor were near the end of their lactation period. The methylene-blue reduction test and standard plate count were utilized in determining the quality of milk produced by cows with infection and with no udder infection. (Table 5.) It is significant to note that 98.5 per cent of all milk samples from non-infected cows were of Class 1 methylene-blue, 80.5 per cent of the cows with *Brucella abortus* infection of the udder and only 52.6 per cent of the samples from cows with streptococcic mastitis were of the same class, with the remaining samples in Classes 2, 3 or 4. The presence of as little as 10 per cent of milk from cows with streptococcic mastitis was sufficient to reduce the methylene-blue quality of the herd’s supply from Class 1 to either Class 2, 3 or 4. A similar decrease in quality was noted in the standard plate count since only 5.8 per cent of the negative cows gave a milk of high count (more than 1,000 bacteria per cubic centimeter) while 23.4 per cent with *Br. abortus* and 68.5 per cent of the streptococcus infected cows gave milk of high count. Since there is such a marked reduction in the quality of milk following infection with streptococcic mastitis it is pertinent to inquire how rapidly this change occurs in the milk.

### TABLE 5

**Results of examination of milk produced by cows with udder infection and with no udder infection.**

<table>
<thead>
<tr>
<th>Cow Composite Samples</th>
<th>Methylene-Blue Class</th>
<th>Bacteria per cc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&lt;less than 100</td>
<td>2 100 to 500</td>
</tr>
<tr>
<td>Brucella only</td>
<td>96.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Streptococcic only</td>
<td>80.5</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>52.6</td>
<td>28.0</td>
</tr>
</tbody>
</table>

(The figures indicate the percentage of samples occurring in the various classes.)

Six cows were studied to obtain information concerning this point. The data of Table 6 reveal that in each case the quality of milk as measured by the methylene-blue reduction test and standard plate count was good prior to infection but was decreased soon after infection. In two of the six
cows the decrease in quality of milk did not occur until from one to three months after infection by the streptococcus while the other four cows exhibited a decrease in quality during the first month. Therefore, a cow with streptococcic mastitis will produce milk of a lower quality as measured by the foregoing test and the decrease of quality may not immediately follow infection by the streptococcus.

2. CLEANLINESS OF THE COW, HER SURROUNDINGS, AND THE CONDITION OF THE EQUIPMENT USED IN HANDLING THE MILK

The cow that is to produce milk should be clean, housed in a clean and sanitary stable in addition to being a healthy individual. The management procedures can do much from the

<table>
<thead>
<tr>
<th>TABLE 6</th>
<th>The quality of milk produced by cows before and after infection.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prior to Infection</td>
</tr>
<tr>
<td>Cow 0</td>
<td></td>
</tr>
<tr>
<td>Standard plate count</td>
<td>100</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>500T</td>
</tr>
</tbody>
</table>

Cow 1

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard plate count</td>
<td>110</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>100T</td>
</tr>
</tbody>
</table>

Cow 2

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>100T</td>
</tr>
</tbody>
</table>

Cow 3

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard plate count</td>
<td>150</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>100T</td>
</tr>
</tbody>
</table>

Cow 5

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard plate count</td>
<td>100</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>60T</td>
</tr>
</tbody>
</table>

Cow 6

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard plate count</td>
<td>200</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>100T</td>
</tr>
</tbody>
</table>

Cow 7

<table>
<thead>
<tr>
<th>Prior to Infection</th>
<th>After Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard plate count</td>
<td>300</td>
</tr>
<tr>
<td>Meth. blue class</td>
<td>1</td>
</tr>
<tr>
<td>Leucocyte content</td>
<td>100T</td>
</tr>
</tbody>
</table>
C. S. BRYAN

standpoint of preventing or contributing contamination from the cow and her environment; for in general, a dirty cow and barn will result in a dirty milk of high bacteria count and a clean cow and barn will mean a milk of high quality at this point.

The equipment used for the purposes of milking, straining, cooling, storing and transporting milk to the receiving plant should be of the seamless welded type, thus presenting a smooth surface that can be readily and efficiently cleaned and sterilized. If the equipment used is in a poor state of repair and presents open seams and dents the opportunities for the collection of dirt are greatly enhanced and the bacteria found in such accumulations have an opportunity of washing off into the milk. Properly cleaned milk utensils result when a good detergent in hot water is used with lots of "elbow grease" to wash dairy equipment. The clean equipment is then ready for bactericidal treatment. The bactericidal treatment or method of sterilization to be used on the individual farm depends on the condition of the farm, the equipment to be sterilized, and the method available (chlorine solution, lye solution, hot water or steam are efficient if properly applied).

It is important to stress that high priced fancy equipment is not essential in the production of a high quality milk but if good methods are used with proper equipment the result will be a desirable milk of high quality. The methods used in the production of milk determine the cleanliness of the cow and the equipment and these in turn influence the sources of contamination to which milk will be exposed during production and handling on the farm. The various sources of contamination contribute definite types of micro-organisms to the milk. These micro-organisms and the sources of excess contamination which they indicate are presented in Table 7. The accuracy of these data was determined by recording the types of micro-organisms in dirt that can get into milk if the methods of production are at fault and checking on methods of production by barn inspection upon finding these micro-organisms in the milk.

In co-operative work with members of the Lansing Health Department the milk of each producer in the Lansing milk shed was subjected to a number of quality tests each month. The tests employed were the methylene-blue reduction test, the sediment test, temperature readings and microscopic bacteria count with numerical values assigned to each class of all tests so as to encourage the production of clean high quality milk and to discourage the production of a dirty milk of very
TABLE 7
The Direct Microscopic Examination of Milk

<table>
<thead>
<tr>
<th>Shape and type of organism</th>
<th>Probable source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short paired (scattered, clumps or in chains)</td>
<td>Utensils—wet unclean surfaces especially milking machines.</td>
</tr>
<tr>
<td>Short thick</td>
<td>Dirty cows or barn manure, dust, dirt, wet milking, flanks.</td>
</tr>
<tr>
<td>Long thick</td>
<td></td>
</tr>
<tr>
<td>(scattered, clumps or in chains)</td>
<td></td>
</tr>
<tr>
<td>Short thin</td>
<td></td>
</tr>
<tr>
<td>Very high counts (with high temperature)</td>
<td>Poor cooling</td>
</tr>
<tr>
<td>Short chains (2-5 elements</td>
<td>Strep. lactis—scum accumulations in crevices or open seams.</td>
</tr>
<tr>
<td>Strep. lactis</td>
<td></td>
</tr>
<tr>
<td>Clumps or single (Staphylococci)</td>
<td></td>
</tr>
<tr>
<td>Tetrads (scattered or clumps)</td>
<td>Dirty cows or barn Streptococcic (more than 6 elements) Strep. mastitis.</td>
</tr>
<tr>
<td>Streptococcic (more than 6 elements)</td>
<td></td>
</tr>
<tr>
<td>Various types scattered insanitary in every respect throughout</td>
<td>Poor production</td>
</tr>
<tr>
<td>Mold (Spores or mycelium)</td>
<td>Dust—in barn or milk-house.</td>
</tr>
<tr>
<td>Yeast (Especially milking machines kept in dusty atmosphere)</td>
<td>Utensils—dust.</td>
</tr>
<tr>
<td>Polymorphonuclear</td>
<td></td>
</tr>
<tr>
<td>Lymphocyte</td>
<td></td>
</tr>
<tr>
<td>Epithelial</td>
<td></td>
</tr>
</tbody>
</table>

One of the following:

1. Milk used too soon after freshening.
2. Milk used too long at end of lactation period.
3. Injury to udder (traumatic).
4. Sterptococcic mastitis—if streptococci are found in unincubated milk samples.

low quality. This information was utilized in formulating a patron quality report which was returned to the producer each month. The quality report in use at the present time is presented. The essentials in high quality milk production are listed on the reverse side of the card for the information of the dairymen.

The data covering a six months’ period including spring, summer and part of the fall season are presented in Table 8. The majority of milk samples having a count of less than
### Microscopic Bacteria Count

<table>
<thead>
<tr>
<th>Bacteria Count</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25,000 per C.C.</td>
<td>20</td>
</tr>
<tr>
<td>25 T. to 50,000 per C.C.</td>
<td>75</td>
</tr>
<tr>
<td>50 T. to 100,000 per C.C.</td>
<td>70</td>
</tr>
<tr>
<td>100 T. to 250,000 per C.C.</td>
<td>65</td>
</tr>
<tr>
<td>250 T. to 500,000 per C.C.</td>
<td>60</td>
</tr>
<tr>
<td>500 T. to 750,000 per C.C.</td>
<td>50</td>
</tr>
<tr>
<td>750 T. to 1,000,000 per C.C.</td>
<td>30</td>
</tr>
<tr>
<td>1 to 5,000,000 per C.C.</td>
<td>0</td>
</tr>
<tr>
<td>Over 5,000,000 per C.C.</td>
<td>-20</td>
</tr>
</tbody>
</table>

### Visible Dirt Sediment Test

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
</tr>
<tr>
<td>Fairly clean</td>
</tr>
<tr>
<td>Dirty</td>
</tr>
<tr>
<td>Very dirty</td>
</tr>
</tbody>
</table>

### Temperature

- 60°F to 65°F
- Above 65°F

The temperature of your milk as it arrived at the plant was 60°F. This should never be above 65°F.

Examining your milk of low score under the microscope we believe the trouble to be:

1. Utensils not properly cleaned and sterilized.
2. Poor cooling - lack of prompt, efficient cooling.
3. Dirty cows or barn - with dirt getting into milk.
4. Dust - in barn or milkhouse.
5. Poor production - unsanitary in every respect.
6. Udder infection.
7. Cells - One of the following:
   (a) milk used too soon after freshening;
   (b) milk used too long at end of lactation period;
   (c) injured udder.

Your bacteria and sediment score should always be above the dotted line.

100,000 bacteria per cubic centimeter (Class 1) are of Class 1 methylene-blue and Classes 1, 2 and 3 of the sediment test. The probable source of excess contamination is not recorded until the bacteria count is 100,000 or more per cc. of milk. Practically all of this milk arrived at the plant with a temperature of 60 degrees Fahrenheit or less and obtained a passing score. The samples in Class 2 of the microscopic examination (100,000 to 500,000 bacteria per cc.) were in Class 2 and some
in Class 3 of the methylene-blue test and in Classes 2 and 3 of the sediment test. Dirty utensils, poor cooling and dirty cows or barn were the major sources of contamination in this group. The number of samples having a temperature greater than 65 degrees Fahrenheit also increased. Approximately 50 per cent of this milk had a passing score, whereas the remaining milk was below passing.

It is evident that the bulk of the milk sent to Lansing over a six months' period was of Class 1 and 2 on the basis of bacteria count. When the bacteria count was in Class 3 (500,000 to one million) the methylene-blue rating dropped to Classes 2, 3 and 4 with the greater portion of the milk showing a larger amount of visible dirt as indicated by the sediment test. In addition to individual cases where dirty cows or barn, dirty utensils and poor cooling were the chief sources of contamination, the types of microbes found in many samples indicated that poor production practices were being followed on the farm. The temperature of this milk was high and very little of it obtained a passing score. The milk with a count of more than one million per cc. (Class 4) was mainly of Classes 3 and 4 methylene-blue and 2, 3 and 4 of the sediment test. The microscopic examination of this milk revealed that the sources of contamination for this class were similar to those for Class 3 (bacteria count). Most of this milk arrived at the receiving station with a temperature of over 65 degrees Fahrenheit and none rated a passing score.

### TABLE 8

A comparison of the bacteria count (microscopic) with the results of other quality tests of milk; together with score of the milk and suspected trouble in the case of poor quality milk covering a period of six months with approximately 1,000 producers. The figures refer to the number of patrons.

<table>
<thead>
<tr>
<th>Bacteria count</th>
<th>Meth. Blue</th>
<th>Sediment</th>
<th>Suspended Trouble</th>
<th>Temperature</th>
<th>Score</th>
<th>Class Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 (&lt;100,000)</td>
<td>120</td>
<td>300</td>
<td>1</td>
<td>30</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Class 2 (100,000 to 500,000)</td>
<td>110</td>
<td>150</td>
<td>20</td>
<td>0</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Class 3 (500,000 to 1000,000)</td>
<td>5</td>
<td>15</td>
<td>1</td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Class 4 (more than 1,000,000)</td>
<td>2</td>
<td>5</td>
<td>20</td>
<td>0</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

**SUMMARY**

Efforts to produce milk and milk products that are safe and of high quality must be directed in two directions: (1) to de-
C. S. BRYAN
termine the health of the cow, and (2) to determine the methods of production, and the condition of the utensils used in handling the milk. The microscope is essential in a quality control program since it is valuable in determining the presence or absence of streptococcal mastitis in the cow and also in determining the bacterial count of milk and in the case of high counts indicating the probable source of excess contamination as indicated by the types of micro-organisms present in poor quality high count milk.

PRESIDENT WESTMORLAND: Thank you very much, Dr. Bryan.

DISCUSSION

DR. J. E. ACKERT (Kansas): Does the type of stanchion influence the types of bacterial contamination of the milk?

DR. C. S. BRYAN: We have made no definite studies on this subject. However, we do have information on the Lansing milk shed area, and in each case we find that when the stanchions are good, allowing the entrance of sunlight, permitting reasonable drying of liquids that would be on the floor, that those which permit the matter of ventilation to take place, whether of wood or metal, will result in a high quality of milk being produced when they are used. But if you have a cluttered-up wood stanchion then you have a marked increase in the source of dust and dirt which may enter the milk produced.

DR. T. F. DANFORTH (Illinois): How did you prepare your milk film for microscopic examination?

DR. BRYAN: In the microscopic examination we followed Breed's technique. The milk film is placed on the slide, fixed by heat so that it will not slide off, then put into xylol for one minute (to remove the fat), drained not necessarily dried, then put into 95 per cent alcohol (to fix film and remove the xylol) for one minute, then again drained and put into methylene-blue stain for one minute.

I wish to compliment Doctor Bryan on the thoroughness with which he has gone into this subject, both from the point of view of the health of the cow and the sanitary handling of the milk after its production.

During the past few years, I have been studying mastitis, and I am in complete accord with the things that Doctor Bryan has said relative to this subject.

Over 95 per cent of the cases of mastitis that we have studied in California have been associated with Streptococci in the milk. A number of tests are available for the diagnosis of mastitis—in fact, there are so many, I believe the practising veterinarian has become confused by their multiplicity and by the various claims made for their relative efficiency as indicators of mastitis.

It is my opinion that we should consider the mastitis problem from two points of view, depending upon the final goal to be obtained. If we are interested only in removing those cows from production having clinical mastitis, this probably can best be done by palpation of the udder, supplemented by use of the strip cup, and perhaps a pH test on the milk using either bromthymol blue or brom cresol purple. However, if we are faced with the problem of controlling the spread
of streptococcic mastitis in a herd, it is then important that all cows infected with the mastitis streptococci be detected and segregated from the non-infected cows. Since all infected cows do not have demonstrable mastitis, it will be necessary for the practising veterinarian or sanitary official to employ bacteriological methods in order to detect them. I believe that the microscopic test as described by Doctor Bryan could be used to advantage here for it does not require a great deal of laboratory equipment, as compared with the blood agar plate method. (Applause.)

DR. C. H. CASE (Ohio): Does staphylococcus infection of the udder result in an increased bacteria count of milk? The city of Cleveland and some other cities offer a bonus for milk with less than 15,000 bacteria count. Our clients want to get that 10c per hundred, so we check the cows every month. The tests give us an idea of trouble. It may be that there are a lot of leucocytes; it may be from bacteria, but as the gentleman from California said, 95 per cent were strops. We do not find that. In thousands and thousands of samples we have tested in our laboratory, we have found that about 25 per cent of them are staphalococci, and they make a high count in the milk. That infection is in the udder; it is a low grade type of infection, and is something to take care of. The staphalococci, of course, are the ones that give most trouble. You did not mention that, doctor.

DR. BRYAN: In our experience, as I mentioned, approximately 99 per cent of the infectious mastitis we found to be caused by the streptococcus group of bacteria. We are working on the staphylococcus problem, but the difficulty that we have run into thus far is that we cannot quickly and adequately distinguish between the so-called pathogenic staphylococci and the udder micrococci which are considered normal inhabitants of the udder.

From a microscopic appearance they are no different, so I really cannot answer your question. But I have every reason to believe they may and do increase the bacteria count, because they do grow out in standard nutrient agar.

We had a very interesting experience from the standpoint of count. We have, among other herds, one herd that has now been free of streptococcic mastitis for a period of about seven years. Their count went away down after they got rid of the infected cows. Frequently the health department, in the bottled raw milk, found an insignificant count. The health department decided to do something, so they said, "We will publicize the counts that we get on bottled milk which we collect once a week. Once a week, therefore, the counts on all bottled milk will be published on all milk produced that day."

The man who had the low count milk began to lose customers. Of course, at first that was of no great concern, because some transient customers were to be expected; but it got to be a real problem. He was losing a lot of customers. So he asked them, "Why don't you like our milk? Is there anything wrong? Tell me; I want to know." But his customers would not tell him.

Finally he asked one woman why she quit buying his milk. At first she would not tell him, but upon urging she finally said, "Haven't you read the paper?" "Yes," he said, "but that should be reason for you wanting our milk," "No," the woman replied, "your count was way down, and we want all we can get in our milk." (Laughter.)

PRESIDENT WESTMORLAND: Is Dr. Gillie, Congressman from Indiana, here? Will you please come forward? (Applause).
DR. GEORGE GILLIE (Indiana): Mr. Chairman, this is indeed a very great pleasure to come before this audience and say a few words.

As you probably know, the government will have a horse doctor or a veterinarian for a Congressman! (Laughter.) The campaign this fall was very interesting. Many of my opponents, as was natural, referred to me as the “horse doctor.” And of course that made me a lot of votes. May I give you a little inside as to how I got into this campaign this fall, by telling you a little story:

A fellow by the name of Deacon Jones had been arrested and sent before the judge. After the judge had heard his case he sentenced him, but before he sent him away the judge said, “I want you to tell me how you came to be named Deacon Jones.”

“Well, judge,” he said, “I really am a deacon. I was elected a deacon in my church.”

“Well,” he said, “it’s this way: You know, down in my church they needed some representation in the rougher element, and that’s how I came to be named Deacon.” (Laughter.)

And I think that is how I came to be elected to Congress. (Laughter.)

This is a splendid opportunity to say a word to you, and I hope in the days to come that I may bring credit to my constituents, and honor to the veterinary profession. Thank you. (Applause.)

PRESIDENT WESTMORELAND: We are certainly glad to have Dr. Gillie with us today, and I am sure he will represent the veterinary profession in Congress in a most satisfactory manner.

We will proceed with the program. The next paper will be, “Meat and Milk Inspection in St. Louis,” by Dr. J. F. Bredeck, Commissioner of Public Health, St. Louis, Mo. (Applause.)

. . . Dr. Bredeck read his prepared paper.

MEAT AND MILK INSPECTION IN ST. LOUIS

By DR. J. F. BREDECK, St. Louis, Mo.  
Health Commissioner

Before an audience of this character it is not necessary for me to dwell at length on the reasons for Meat and Milk Inspection in any community. We have long passed the day when we need go into lengthy discussions on why such well recognized public health measures are instituted. However, it would be more profitable, more interesting and perhaps still more embarrassing to discuss the reasons why so many communities have failed to provide adequate Meat and Milk Inspection. Briefly, we might state that all public legislation with regard to Meat and Milk Inspection has two primary purposes: (1) To protect the public health and (2) to protect the public from fraud. All legislation, therefore, must, of necessity, be carefully considered, and must insist upon essen-
tials and exclude all controversial matters. If there were ever two public health measures that require uniformity in legislation and uniformity in performance, it is Meat and Milk Inspection. Unless we all use the same terms, and have the same regulations, speak the same language, we will have fadists—those with personal hobbies and fancies trying to impress their ideas upon various communities. Nothing is so demoralizing as to have laws on the books which are unreasonable and will not stand the test of scientific scrutiny or practicable application. A law that is not backed up by experience and by practicability leads to law evasion and, what is worse, total disrespect of law. Uniform legislation, based on accepted standards rather than personal opinion, is useless, unless there is uniformity in enforcement. It is useless to pass laws knowing in advance that neither funds nor adequate qualified personnel will be provided for their enforcement.

In St. Louis we have kept in mind two fundamental principles with regard to Meat and Milk Inspection, namely—that we wanted all of our legislation to protect the public health, primarily, and next to protect the public from fraud. In order to carry out these two fundamental principles we have insisted on two further fundamentals, namely, uniformity in regulations and uniformity enforcement by adequate well qualified personnel.

The Health Officer must insist upon these fundamentals and he must be willing to make the necessary sacrifices and be prepared to meet endless objections if he hopes to succeed. A knowledge of what should be done must be backed up by a determination that it shall be done. Fortunately, both Meat and Milk Control have had sufficient years of experience by the federal government to act as a basis for uniformity in legislation. However, the task and the obligation of seeing that adequate funds and well qualified personnel are provided to enforce the regulations is up to the integrity and honesty and determination of local and state health officers.

With these preliminary remarks I should like to discuss—first of all—Meat Inspection in St. Louis. Up to the year 1930 there were no adequate regulations for Meat Inspection in the City of St. Louis. Neither was there an adequate qualified personnel to enforce any regulations. It might be of interest to you to know just how our ordinance was passed in the City of St. Louis in 1930. A campaign was waged in the city which carried for its slogan “Buy Inspected Meat.”
As a result of this campaign the government inspected houses rapidly absorbed the business of the local plants that were not under adequate inspection if inspection at all. Before many months rolled along almost two-thirds of the business of the local plants was lost to government inspected plants. The industry, itself, pleaded to have an adequate ordinance with adequate personnel for its enforcement passed so that it could compete with government inspected plants.

"Necessity Was the Mother of Invention" and the St. Louis meat ordinance grew out of the fact that inspected meats were preferred by consumers to uninspected meats. Our ordinance, therefore, was drawn up with a full knowledge that it must approximate the federal regulations insofar as they could be practically carried out, locally. Only by such an ordinance and only by such an adequate qualified personnel could the local plants hope to exist. We have no uninspected meat in the City of St. Louis, and our ordinance qualifies the type of personnel to be appointed for the enforcement of the ordinance.

We have anti-mortem and post-morten inspection of all animals. To insure uniformity of performance comparable to federal inspection. All of the supervisors that have been in charge of Meat Control since the passage of the ordinance have been supervisors in Meat Inspection in the Bureau of Animal Industry before their appointment in the City of St. Louis. Under the supervisor of Meat Inspection we have ten well qualified veterinarians and ten well qualified lay inspectors to carry on the work. In addition we have a clerical force to carry on the necessary routine office work, file records, etc. This meat inspection force has made 370,825 anti-mortem inspections of animals and 370,775 post-mortem inspection of carcasses, yearly. In addition, they have made inspections in processing plants, totaling 46,323,840 pounds, yearly.

Inspectors carry on their work in 24 slaughtering plants and 31 processing plants. We have had little difficulty in the enforcement of our ordinance because the meat industry, itself, realizes, if not altogether from a public health standpoint, most certainly from an economic standpoint, that it cannot hope to exist without proper meat inspection by an official agency.

The Health Division, itself, has realized that to discharge its obligations it must approximate the well recognized standards of the federal government in meat inspection. The Health Division, furthermore, has realized that in order to
have this uniformity it must have men fundamentally trained and familiar with federal inspection to head our Meat Inspection Service. The veterinarian in control of meat inspection must, of necessity, know the broad field of meat inspection as carried on by the federal government before he can enforce local meat inspection so that it will be comparable with federal inspection and accomplish the two primary purposes, namely, to protect the public health and to protect the public from fraud.

We have experienced one major difficulty in St. Louis and that is we cannot cope with the federal government up to the present time with the civil service regulations, assuring certainty of tenure of office and provisions for retirement. Our veterinarians and lay inspectors must rely upon a small salary, without any provisions for retirement. Despite this handicap, we have been successful up to the present in employing well qualified veterinarians and lay inspectors—with experience.

Before St. Louis had adequate meat control regulations and an adequate well qualified force in the field, it was, as many other communities are today, the dumping ground for uninspected meat products. I understand from reliable sources that only two-thirds of the meat producing animals slaughtered for food purposes in the United States receive adequate inspection. The federal government certainly takes care of its problem of interstate shipment so that all meats for interstate shipment are assumed to be adequately inspected. The other one-third is up to state, county and municipal governments. They are the ones, therefore, that have failed in their obligations to the public health and to the public at large. As far as I know there is only one state that maintains a state-wide meat inspection service. However, there are a number of progressive municipalities that have inaugurated local meat inspection for meat sold within their respective jurisdictions. This local or state meat inspection, therefore, supplements and in no way replaces federal meat inspection. These municipalities recognize federal inspection but include those plants not doing interstate business. There are also a few counties that require that all meat sold within their borders shall have passed adequate inspection. Meat inspection in St. Louis has protected the public health, protected the public from fraud, and protected the local meat industry so that it can favorably compete with federal inspected plants and not make apologies for its existence.

We have stressed the labeling to conform in uniformity
with federal inspected plants even to the point of calling goat mutton. Not being able to find any relationship whatsoever in the derivation of the word mutton which would indicate goat, it is inspiring, however, to find poetic repose and justification for this commercial labeling in the words of the great poet, "A rose if called by any other name would smell as sweet."

Now that we have covered meat inspection in St. Louis we shall go on with the discussion of milk inspection in St. Louis. Up to 1933 there was no adequate milk inspection in the City of St. Louis, either on the farms or in the plants. In 1933 a reorganization in the Health Division made it possible to employ a few competent professional men to make studies of the situation with a purpose of instituting adequate regulations to be enforced by a well qualified personnel. After our preliminary studies it was perfectly obvious that in reality we had no milk inspection in St. Louis—that the regulations and the personnel could not guarantee public health protection or protect the public from fraud; nor could it guarantee the public a clean, wholesome product. It did not meet the essentials of sound public health practice and we concluded that something had to be done about it.

In our opinion there was only one ordinance that really met public health requirements satisfactorily and that was the Standard Milk Ordinance. This was adopted as our minimum standard with certain upward revisions to meet local conditions. We incorporated in that ordinance provisions for adequate funds to satisfactorily carry out the full intent of the ordinance. We fully appreciated that no matter how sound the Standard Ordinance may be it could not be enforced without funds. The Health Division advocated this ordinance in 1933 and was met by the most violent opposition by both producers and distributors. Every conceivable method was used and every possible argument was brought forward to defeat the ordinance. The ordinance was introduced and defeated, reintroduced and again defeated by the Board of Alderman. It was finally introduced a third time in 1936 and passed by unanimous vote on December 15, 1936. In the words of the late Herman Briggs, "We have overcome at last, the forces of ignorance, stupidity and cupidity."

What a contrast to the passage of the mat ordinance which had no opposition but the united support of the industry. When the ordinance was finally passed on December 15, 1936, it was clearly understood by the Board of Aldermen that the passage of the ordinance with provisions for a tax to ade-
quately enforce the ordinance, would still fail, unless they passed another ordinance for the qualified personnel necessary to carry out all the provisions of the ordinance. The Personnel Ordinance was passed in February, 1937, which made provisions for as high type of personnel as will be found in milk control in any community. This ordinance provided for a veterinarian, a public health engineer or an agricultural school graduate to take charge of milk control, with several years of practical experience on both dairy farms and in pasteurization plants. Under him there are three veterinarians who must have practical experience of several years in milk control work, to act as special supervisors over the entire farm program. Under these three supervisors there are provided 30 inspectors all of whom must be veterinarians, agricultural school graduates or engineers. They need not have had previous experience. Regardless of their previous experience they are all trained by the chief of service and his three supervisors to insure uniformity. When we started the program in 1933 we had approximately 16,000 producers listed as shipping to our distributing plants, which number 47. When the grades were announced the first time, June 15, 1938, we had left, approximately 3,700 producers. The remainder had failed or were unwilling to go along with the program and they had to be cut off the approved milk supply. Since the first announcement of grades June, 1938, over 300 new producers have come on the market meeting the ordinance requirements completely before being permitted to ship milk on the approved side.

The effect of regulations on the farms naturally cut down the volume of milk, but never to such an extent that it was serious at any time. It is true that in the fall of the year there was a shortage which was able to be supplied by bringing in approved milk and cream from cities with approved compliance to the standard ordinance. The only difference between the shortage now and the seasonal shortage, previously, was that there has been no let-down whatsoever in the sanitary quality of the milk or cream during shortages, and there is every indication to believe that this seasonal shortage will be overcome in the very near future. Uniform production is the answer. Surveys made in the various districts show that there is less than 7 per cent variation in the grading of the farms of the highest and the lowest for any inspectors area. In a survey now being conducted for the second grade announcement the farm ratings will be above 90 per cent compliance.
I believe today we can state that the producers are convinced of the value of the Standard Ordinance and the reasonableness of enforcement as carried out by a well qualified technical professional personnel. This personnel, I believe, has rendered invaluable services to the producers in many ways, even beyond its official duties in carrying out the provisions of the ordinance. The producers today are proud of their permits because they know that they are producing a protected, clean, wholesome milk supply. They further know that the milk haulers take care of this milk from the time they receive it until it gets to the pasteurization plant. They realize that the increased price they get for their milk is a result of improvement that have been made in equipment and practices which are different from their neighbor who is not on the approved milk market. They realize that they are protected because they no longer have to meet the competition of the farmer who has neither equipment nor sanitary practices, who has neither a protected water supply nor a sanitary privy.

He was disgusted for years with the policy that everyone received the same price, regardless of how he handled his milk. He knows that today, and for the past several years, no milk producers can continue to ship approved milk to St. Louis unless he meets the ordinance requirements. He knows also that sufficient inspectors are provided by the Health Division so that they can drop in at irregular intervals and see just what his practices are. He knows also that this inspector can be and is of real service to him. He does not approach the farmer with the old idea of police power, but makes his inspections and recommendations with a spirit of helpfulness. He instills into the producers a sense of responsibility, and appreciation that they are producing an essential food which must be cared for in an unusually sanitary manner, because it carries potential dangers to the public health. The producer realizes he must take every precaution in keeping diseases and filth out of his milk and that it must be cooled immediately to keep down even the normal bacteria of milk. He knows also that the receiving stations to which he sends milk have had to make tremendous improvements and that there again the same care is exercised that he must exercise. He sees with his own eyes that when this milk leaves his farm the same scrupulous care is taken of his milk as he is required to care for it. He sees the contrast in the receiving station which receives milk for condensery purposes or for creamery purposes. There he is impressed im-
mediately that his milk is different and that it is handled in an entirely different way.

When he sends his milk direct to the pasteurization plant and he contrasts this to the plant that is not putting out unapproved milk, he knows the difference. He sees for the first time that the regulations are reasonable; that they are uniform for the farmer, the producer, the truck-hauler, for the receiving stations and the pasteurization plants—no matter how small—no matter how large. He can go from one area to another and he sees the same compliance. He sees that the inspector he has, is asking for the same things that an inspector in another area is asking. He knows that his milk is regularly tested at the receiving plant or pasteurization plant. He knows that this test is made by the Health Division personnel and he has come to realize that it is fair and impartial. When his milk falls down in any requirements he knows the reason, or if not, he knows where to get the answer. He knows the inspector is there to help him, not to harm him. He is not a policeman, he is a health officer which means an education.

With regard to the pasteurization plants. This work covers about 45 plants within and without the city. There is an engineer in charge of plant inspection work, responsible for all plant rating and the collecting of samples within the city and at plants. Under him are 12 inspectors who must have had practical experience under proper public health supervision in Milk Plant Inspection. Unless they have had such practical experience under proper public health supervision, they must have at least one year of college before they can be appointed for a plant inspection position. Several smaller plants in the past few years were not able to meet inspection requirements. However, other new pasteurization plants have come into the field so that the total number of distributors today is approximately what it was about five years ago. The progress made in the rebuilding, re-equipping and the placement of sanitary fittings and a proper appreciation of sanitary requirements, in general, has been a revelation. Here again many of the plants have gone beyond what our actual requirements call for. A sense of pride and a spirit of rivalry has evidently inspired them to do even greater things. We are proud, indeed, of the pasteurization plants and the spirit of co-operation which has been manifest.

I believe today the distributors feel just as the producers feel—that unfair competition has been removed insofar that every plant, no matter how small, or how large, must com-
ply with the minimum requirements of the ordinance or their product will be degraded as provided for in the ordinance. No plant can put its Grade A label on its product unless it complies with the ordinance. No plant can receive milk from producers except those that are qualified. A producer in shipping to one plant is qualified to transfer to any other plant. A shipper that is cut off from one plant is cut off from all plants.

Today it is not a question of one distributor trying to push requirements on the farms and as a result have the producers go to another distributor. He knows full well that farm inspection is handled by the Health Division. He also knows from his own investigations as well as the Health Division's that those plants that compete with him are meeting the same requirements as he does. He furthermore realizes that today there is a greater consumer confidence in the milk supply than was ever manifest previously. He can go with his head up and make no apologies. He is delivering a quality protected milk and the consumers have demonstrated their interest and confidence by an ever increasing consumption of milk since last June when the first grades were announced.

We have not reached our goal in consumption. However, St. Louis is now definitely on the upward move toward a minimum consumption of one pint per capita. St. Louis, among the large cities, is unique insofar as we have no raw milk whatsoever. All of our milk is pasteurized, even certified milk. Distributors appreciate that pasteurization is not a cleaning process but an additional essential public health protection.

Today, we know every detail on the farms, receiving stations and pasteurization plants. We have splendid laboratory services—experienced chemist and bacteriologists to carry on the necessary examinations in the milk control program. We take nothing for granted on the farms or in the pasteurization plants or in the receiving stations. All official tests and all grading is done by our own personnel. All of the matha-line blue tests and all plate counts are by the Health Division personnel so that we are in possession of office records which we can certify to as our own at any moment. We have sufficient personnel in the field, that upon short notice, any producer may be visited as well as any receiving station and pasteurization plant. The present cost of administering milk control is covered by a 5c tax for every 100 pounds of
approved milk received, or in the case of cream 1 1-3c per pound of butterfat.

In conclusion, I believe that I can honestly state that we have milk control in St. Louis, carried on by a well qualified technical personnel that is a credit to producers and distributors, meeting all the requirements for public health protection. It is a program that is uniform, a program that is guaranteed by adequate funds and more important, a well qualified personnel. Meat and milk inspection have been successful because we have adhered very closely to fundamentals and uniformity and insisted on sufficient funds to provide for a well qualified personnel. We do not pride ourselves at all in having done anything original, we have made no great discoveries, but we have made an honest, sincere effort and have received splendid co-operation which has been responsible for the successes we have had. We have always been convinced that sound public health principles enacted into sane practical legislation—carried out by a sincere, honest, well qualified personnel can give the public what it needs in public health—protection and real quality foods in its meat and milk supply.

The necessity for improving meat and milk supplies throughout this country is great. The workers are only too few and, unfortunately, too many are not as well equipped as they should be. We must transfer our public health knowledge concerning meat and milk control into official action. Where there is a will there is a way. Perseverance and a sincere determination to render real public health service is all that is necessary to have meat and milk control. The path is clear if the health officer wishes to follow it. It may be a bit thorny or rocky but it is clear.

To get a real program over, one that really means something, the health officer will meet obstacles, but if he has learned how to say the hardest word in the English Dictionary "NO" he cannot fail. The health officer needs the support of all agencies and co-operation of such organizations as yours can do much to support and to put into practice, sound public health measures in meat and milk control. To that end I wish you all Bon Voyage.

PRESIDENT WESTMORLAND: Thank you very much, Dr. Bredeck. Is there any discussion?

DR. DUCKWORTH: Dr. Bredeck, is there any St. Louis provision for general pasteurization that has been tested in the Supreme Court?
DR. BREDECK: The state laws of Missouri do not give permission to pass a law whereby milk must be pasteurized, but we get around it in this fashion: We permit raw milk to be certified to. We stipulate that it must be certified, and there is only one large dairy that has certified the name "pasteurized." That is the way we get around that. In other words, we permit raw milk, but we lay down the rules of the kind of raw milk, and then it must be certified to.

PRESIDENT WESTMORLAND: The next paper will be the report of the Committee on Meat and Milk Hygiene, by Dr. A. F. Schalk, Chairman of the Committee.

DR. A. F. SCHALK (Ohio): First may I take this opportunity to thank everyone who has contributed to the program this afternoon. I must say that the Committee is very proud to have had you on its program.

. . . Dr. Schalk read the report of the Committee on Meat and Milk Hygiene. . . .

REPORT OF COMMITTEE ON MEAT AND MILK HYGIENE

DR. A. F. SCHALK, Chairman, Columbus, Ohio.

Dr. J. S. Koen, Storm Lake, Iowa Dr. M. F. Barnes, Harrisburg, Pa.

The purpose of adequate meat inspection have been set out by the Bureau of Animal Industry.

The benefits to public health and the live stock industry have been described today. The benefits are well known to everyone who is at all acquainted with the service.

The fact that only approximately two-thirds of the nation's meat supply is adequately inspected has been established.

The need for adequate inspection over the remainder of the nation's meat supply is readily apparent. Abuses surrounding the slaughter, preparation, and sale of uninspected meats and meat food products, are well known to regulatory authorities—but not to the public generally.

An important obligation of regulatory and public health officials is their bounden duty to prevent the sale of diseased and unfit meats or meat products.

The accomplishment of efficient state and municipal meat inspection as a supplement to B. A. I. supervision is supplied by some states and cities.

Assistance by B. A. I. inspectors-in-charge to state and city officials who desire to establish and maintain supplemental meat inspection service over meats prepared and sold locally is provided in Regulation No. 22, B. A. I. Order 211. This regulation reads as follows:

"Inspectors-in-charge shall co-operate, whenever practicable to do so, in compliance with these regulations, with state, municipal and other local officials in matters pertaining to meat inspection."

"Section 2. Inspectors-in-charge shall confer with such officials at their stations and inform them of the federal meat inspection service—what the Bureau is accomplishing in that particular locality and, in turn, ascertain what is being done by the local officials. Such
A REVIEW OF THE 1938 OUTBREAK OF INFECTIOUS
EQUINE ENCEPHALOMYELITIS IN
THE UNITED STATES

By M. S. Shahan, L. T. Giltner and H. W. Schoening,
Washington, D. C.

Pathological Division, Bureau of Animal Industry

The Bureau of Animal Industry has for the past several years been interested in the collection of various data pertaining to so-called sleeping sickness in horses. Questionnaires for the use of the various co-operating state officials were first sent out in 1935 when a total of about 23,000 cases were reported. In 1936, a relatively dry year, which for this or
other unknown reasons was apparently unfavorable toward the spread of the disease, only about 4,000 cases were reported. In 1937, the most severe epizootic ever experienced in this country occurred, about 170,000 cases being reported. As compiled to date, no less than 79,606 cases occurred during the 1938 epizootic season. The average mortality rate during the actually recorded years has been maintained at about 25 per cent of the affected animals, until 1938 when there was a decline to about 21 per cent.

The above figures probably do not present the true picture of the ravages of the disease. In some cases, estimates rather than actual counts have obviously been submitted. Suffice it to say that on the basis of information available at this writing there were less than half as many cases in 1938 as were reported in 1937. But in addition to this difference, and the decreased mortality, the disease generally appeared earlier in the summer and in some cases persisted longer. There was a marked decrease in the number of cases in areas which had been severely affected in 1937 but elsewhere the disease spread. Thus such states as Connecticut, Illinois, Kentucky, Maine, Massachusetts, Michigan, Ohio and Rhode Island, which had not previously been affected or had only sporadic cases, suffered more or less serious losses in 1938. The much more virulent eastern type of the disease has spread as well as the western type, but to a somewhat lesser degree, which is heartening. It nevertheless appears that unless the spread is stopped we may reasonably anticipate disease due to either type of virus in a given locality sometime in the future.

Fortunately for vaccination procedures this has not yet occurred to the best of our knowledge. During 1938 a considerable number of strains of virus have been recovered by the several interested agencies, according to the Bureau's records, and the reports received. In all cases where typing has been carried out in 1938 or previous years nothing but eastern virus has been identified along the Atlantic seaboard. In the same way, nothing but western type virus has yet been found west of the Appalachian and Blue Ridge Mountains. Fourteen strains of virus were this year recovered and compared immunologically in the Bureau laboratories, with the result that the eight strains from Massachusetts, North Carolina and Florida all proved to be of the eastern type and six strains from Kansas, Minnesota and Illinois were found to be indistinguishable from those, no less than 100 in number, which originated in western cases of previous years (1).

Since the identification by Meyer, Haring and Howitt (2) of
the causative agent of the disease in the western United States, and by Ten Broeck and Merrill (3) and Shahan and Giltner (4) of an immunologically distinct virus in cases along the Atlantic seaboard, infectious encephalomyelitis has been diagnosed in 41 of the 48 states. Only nine states, namely, Alabama, Georgia, Mississippi, New Hampshire, New York, Pennsylvania, Tennessee, Vermont, and West Virginia reported freedom from the malady in 1938. Since 1931, actual recovery of virus has been accomplished in 27 states. Delaware, Georgia, Maryland, New Jersey, North and South Carolina, and Virginia viruses had been typed by the Bureau as eastern. During this year Florida and Massachusetts viruses were also identified as of the eastern type. Viruses from California, Idaho, Iowa, Montana, Minnesota, Nevada, North and South Dakota, Texas, and Utah had all been determined to be of western type and immunologically identical. During 1938, Kansas and Illinois viruses were added to the list. Colorado, Indiana, Louisiana, Nebraska, Ohio, and Wisconsin cases have yielded virus either in 1938 or previous years but none of these have been specifically typed, according to the Bureau's information.

A clinical diagnosis only has been made in nine states, viz.: Arkansas, Kentucky, Maine, Mississippi, Missouri, Oregon, Rhode Island, Washington, and Wyoming. The clinical diagnosis has been substantiated by histopathological examinations of Arizona, Connecticut, Michigan, New Mexico, and Oklahoma cases.

In the writers' opinion the actual demonstration of virus from as many cases as possible in each epizootic should be sought. While clinical diagnosis may be accurate enough for the needs of practitioners, demonstration of the specific cause is conclusive. It is believed that the histopathology of the disease is diagnostic for all practical purposes. However, in view of the existence of at least two immunologically distinct viruses, knowledge of the type of the causative virus is also of prime importance, and in our opinion the type of every strain recovered should be determined, if possible.

It may be recalled that the United States is but one of several countries which have been practically simultaneously involved in severe epizootics of infectious equine encephalomyelitis. The provinces of Saskatchewan, Manitoba, and Ontario, in Canada, have experienced more or less severe epizootics. Several South American countries—Argentina, Brazil, Peru, Chile, Venezuela—have also suffered from the disease; Russia, Japan, and India, likewise. In 1936 Kelser
reported recovery of eastern type encephalomyelitis virus from a horse in Panama (5). It is interesting to note that the animal had been shipped from Nebraska some years previously.

The causative virus in Argentina has been found by Rosenthal (6) and by Howitt (7) to be immunologically indistinguishable from the western type of this country. Howitt's immunological studies in guinea pigs also differentiated the Russian type from either known North American type. There Japanese virus is believed by Emoto, Kondo and Watanabe (8) to be two types, one resembling that of Germany’s Borna disease and the other similar to western type virus of the United States. The Venezuelan virus causing “pesteloco,” has not been exactly identified as far as the Bureau is aware. The same is true of the virus of some of the other South American countries. Howitt (9) has concluded that both American viruses are distinct from that of Borna disease.

When compared immunologically, North American strains of equine encephalomyelitis virus have been found distinct from vesicular stomatitis virus (Syverton, Cox, Olitsky) (10). Neutralization tests of sera from immunized animals or convalescent persons have shown no relationship between human encephalitis (St. Louis), herpes, Japanese types A and B encephalitis, poliomyelitis, louping ill, blue tongue, and fox encephalitis (Webster, Fite, Clow) (11). Howitt (12) also found no cross-immunity between equine encephalomyelitis and poliomyelitis. The writers have found no neutralization of the equine virus by a potent fox encephalitis anti-serum supplied by the Bureau of Biological Survey.

Through the last few years a number of horses recovering from vesicular exanthema (California) have been made available to the writers by Doctors Cotton and Crawford, of the Animal Disease Station, National Agricultural Research Center. None of these or any of several proven carriers of infectious anemia virus have been found resistant to the artificial injection of encephalomyelitis virus.

The probability of human infection with the equine virus was early suggested by Meyer (13) when in 1932 clinical cases of encephalitis in men who had associated with sick animals were reported. The pathological findings in one case were included. Later, prior to the actual demonstration of virus in man, the presence of substances in the blood of a recovered human case of encephalitis which were capable of neutralizing western type equine virus was found by Eklund and Blumstein (14) in Minnesota. These writers
and Wesselhoeft, Smith and Branch (15) described histopathological changes in fatal human cases which strikingly resemble those to be found in the natural disease in horses and mules.

Conclusive evidence of direct relation between equine encephalomyelitis and human encephalitis was obtained this year (1938). Fothergill, et al., (16), Webster and Wright (17), and Howitt (18) demonstrated the presence of virus indistinguishable from that of the equine disease in children affected with encephalitis. Both types of virus were involved. The writers have had an opportunity to expose eastern immune, western immune, and control horses to a virus from a Massachusetts child with results clearly indicating it to be eastern equine encephalomyelitis virus (19). Cases of encephalitis in man occurring during equine epizootics of encephalomyelitis appear from reports to have been exceptionally numerous in 1938. However, the cases mentioned constitute the only ones proven to be due to equine virus, so far reported.

The entire subject of species susceptibility is one of the greatest importance in infectious equine encephalomyelitis, especially since the reservoir of the virus between epizootics is unknown. During an outbreak it is easily conceivable that affected horses in whose blood the virus circulates for a time provide the infection necessary for spread. Occult cases are also to be considered here. But although searches have been made, an equine carrier has not yet been identified. It is quite possible that some of the many other susceptible species may be found to be implicated in the perpetuation of the disease. Meyers' early list of animals susceptible to western type virus by artificial exposure included guinea pigs, rats, mice, rabbits, and monkeys, as well as the natural hosts (20). Many others have been added to this list. The pigeon and the calf were reported to be susceptible in 1933 (21). At the same time sheep, dogs, and cats were found non-susceptible. Later trials confirmed these results, except in the case of the dog, one of which was later infected by intracerebral injection (22). Rosenbusch (23) added goats to the list of animals susceptible to western type virus. This was confirmed by the writers in 1936 (24) when ducks were reported susceptible and in addition goats, hens, and the European hedgehog were found susceptible to eastern type virus. Differences in the infectivity of the two types of virus were then recorded. It was found that sheep, pigs, and dogs were quite uniformly susceptible to eastern but gen-
erally refractory to western type virus. Remlinger and Bailly (25, 26) reported the greylag goose (*Anser cinerius*), hawk (*Circus rufus*), European blackbird (*Turdus merula*), the tawny vulture (*Vultur fulvus, Briss*), the white stork (*Ciconia alba*), and the common mallard duck (*Anas boschas*), to be susceptible to Argentine virus. Of these only the mallard duck is found in this country. In 1935 Remlinger and Bailly (27) reported failure to infect cats by feeding, which was confirmed by the Bureau (22). However, cats can be infected by intracerebral injection of eastern type virus (24). Limited trials have shown the common American opossum to be insusceptible to either type of virus. The gopher (*Citellus richardsonii Sabine*) was shown to be susceptible to western type virus by Syverton and Berry (28). Ten Broeck (29) reported turkeys as well as chickens, the last of which had been previously reported as susceptible by intracerebral inoculation (24), to carry virus in the bloodstream without clinical symptoms following superficial inoculation. Some few of these birds in epizootic areas carried neutralizing substances in the bloodstream. Recently the writers have found the guinea fowl (*Numida meleagris*) to be susceptible to both eastern and western viruses by intracerebral inoculation.

During the encephalomyelitis epizootic in 1938 in Montana a sickness never before observed there appeared in wild ducks on certain lakes within the limits of the outbreak of the equine disease in that state. The disease resembled the so-called western duck sickness, generally conceded to be a form of botulism, although the increased concentration of alkali salts in the lake waters occasioned by excessive evaporation was suggested as the cause in this instance when an estimated 40,000 birds died. The symptoms were characterized by weakness of the legs and wings, and finally complete prostration and death in a large percentage of the cases. The similarity of the symptoms as described in these ducks to those observed in birds injected with encephalomyelitis viruses, as well as the epizootiological suggestion, led to close examination of the brains of several dead ducks obtained through Dr. G. W. Cronen. No evidence of the presence of equine encephalomyelitis virus was found, although bacterial contaminants somewhat complicated laboratory animal inoculations and the cessation of the disease precluded further examinations. Microscopically, lesions somewhat suggestive of a virus infection were observed. Congestion and perivascular hemorrhages were seen in most of the sections. A diffuse infiltration consisting of lymphoid and large mononuclear cells was found, and many of the small vessels were
surrounded by a single layer of cells of the same types. Both lymphoid and macrophagic cells were seen surrounding many of the large nerve cells. While nothing conclusive was found from these observations, it is urged that further studies of such specimens be made whenever material becomes available. Incidentally, the duck disease ceased soon after the advent of killing frosts as is the general rule with infectious equine encephalomyelitis.

A most interesting finding has been made recently by Tyzzer, Sellards and Bennett (30), who report from Connecticut the presence of the equine virus, eastern type, in a number of ring-necked pheasants, which succumbed after exhibiting symptoms of paralysis. This constitutes the first recovery of virus from naturally infected species other than the horse, mule, and man. Those workers also showed that adult quail were susceptible to eastern virus. Still more recently Fothergill and Dingle (31) have identified equine encephalomyelitis virus in naturally infected pigeons in Massachusetts. Just what place in the perpetuation or dissemination of equine encephalomyelitis virus each of the many susceptible species has remains a question—one which appeals to researchers everywhere.

Vectors of virus, blood-sucking insects, are generally believed to carry the disease from sick normal animals, mosquitoes being especially incriminated by repeated successful transmission experiments dating from Kelser's original discovery (32). Syverton and Berry (33) have demonstrated that the tick (Dermacentor andersoni) is capable of transmitting artificial infection from the guinea pig to the ground squirrel or gopher. But despite the strong experimental evidence supporting mosquito transmission and the circumstantial evidence derived from the epizootiology of equine sleeping sickness, insects carrying the virus in nature have as yet not been found. Several attempts along these lines have been made. The Bureaus of Animal Industry and Entomology and Plant Quarantine (24) endeavored to find virus in native maryland mosquitoes in 1933. Philip and Cox examined Montana arthropods for this purpose in 1936 (34). In 1937, the above named Bureaus again made a concerted effort to demonstrate virus in insects in encephalomyelitis epizootic areas. (35). Among the insects then examined were mosquitoes of numerous species, tabanids, stable flies, house flies, and the spinose ear tick. Despite these efforts nothing to confirm the well established experimental evidence has accrued. It should be realized, however, that such work must
by nature be more or less haphazard and early failures should not be too discouraging.

One of the most gratifying accomplishments of the year 1938 in encephalomyelitis studies was the development of an improved formolized tissue vaccine, made from chick embryo, by Beard, Finkelstein, Sealy, and Wyckoff (36). The product first developed for the active immunization against encephalomyelitis (37) consisted of formolized brain tissue. According to all information which has accumulated since the development of chick embryo vaccine, chick embryos, first infected with equine encephalomyelitis virus by Higbie and Howitt (38), contain much larger amounts of virus than does brain tissue. The virus can readily be inactivated by formalin and a strong immunity results from injection of the product. Important studies of formolized chick embryo tissue vaccine have been made by Mitchell, Walker and Plummer (39) and Lyon and Wyckoff (40).

The Bureau has been engaged in contemporary studies and while there are certain unsolved technicalities to be considered there is every indication as to the potency of a properly prepared vaccine. Horses as well as guinea pigs develop an immunity of high degree through the use of this vaccine, even horses resisting a most severe exposure, that of direct intracerebral inoculation.

The writers are permitted at this time to report the results of some months' work in the Bureau's laboratories (41). Immunization against eastern type infection appears more difficult of accomplishment than that against western type. While one dose of as small an amount of vaccine as 0.5 cc frequently if not generally induces immunity against intracerebral exposure of guinea pigs with western virus, two doses at an interval of some days is usually required to effect immunization against eastern virus. A large number of commercial vaccines prepared with virus from cases of earlier years have been tested with the view of determining whether they would induce protection against strains of virus recovered from 1938 cases. They have been found effective in this respect.

The keeping qualities of formolized chick embryo tissue vaccine, as well as the longevity of the immunity resulting from its use, are being investigated. It has been found that exposure of the product to high temperatures such as usually prevail during the summer months rapidly lessens the antigenecity of the product. Light as well may be deleterious. Even exposure to room temperatures of 75 to 80 degrees F.
in the dark results in a gradual lessening of potency. It appears this vaccine should be stored under refrigeration up to the time of actual use for best results. Tests of longevity of immunity in the guinea pig as well as the horse are now under way. Tables I and II present the results of tests at periods of three and six months after vaccination with a commercial western type formalized chick embryo vaccine.

These tests clearly show immunity against intracerebral exposure, the severity of which almost surely is not equalled in nature. An additional group of three horses vaccinated at the same time as those in Tables I and II are destined for exposure in the future, in order to obtain further information on the duration of immunity. Suffice it to say at this time that an immunity covering at least six months, as shown

**TABLE 1**

<table>
<thead>
<tr>
<th>Horse</th>
<th>No.</th>
<th>Vaccine (formalized)</th>
<th>Exposure by intracerebral injection of 0.5 cc of</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10 cc chick embryo</td>
<td>2x10^-3 saline suspension of virus-bearing guinea pig brain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5/12/38</td>
<td>8/25/38</td>
</tr>
<tr>
<td>922</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1039</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1097</td>
<td></td>
<td>No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1095</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1073</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Later exposed to Massachusetts human encephalitis virus (eastern type equine encephalomyelitis virus) and died.

(2) Typical western type encephalomyelitis-virus recovered and pathology demonstrated.

**TABLE 2**

<table>
<thead>
<tr>
<th>Horse</th>
<th>No.</th>
<th>Vaccine (formalized)</th>
<th>Exposure by intracerebral injection of 0.5 cc of</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10 cc chick embryo</td>
<td>10^-3 saline suspension of virus-bearing guinea pig brain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1047</td>
<td></td>
<td></td>
<td>5/12/38</td>
<td>11/18/38</td>
</tr>
<tr>
<td>1049</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1066</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1095</td>
<td></td>
<td>No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1114</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1115</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Typical western type encephalomyelitis-virus recovered. Pathological examination not completed at time of this report.
in Table II, may be anticipated following injection of two
doses of potent formolized chick embryo vaccine.

While the Division of Virus-Serum Control, of the Bureau
of Animal Industry, reports the production of 1,671,123 ten
cc-doses (835,561 -2-dose prophylactic treatments) of for-
molized chick embryo vaccine, and it is probable that much
if not most of this production was actually administered in
the field, only 78,403 horses and mules have been reported to
date as having been vaccinated with the product in 1938 in
this country. Of course, however, large quantities of the
commercial product prepared in the United States were used
in Canada. It may be estimated that no less than 500,000 horses
and mules were vaccinated with formolized chick embryo
vaccine in the U. S. in 1938. A total of 15,342 animals re-
ceived formalin-treated horse brain vaccine. The early intro-
duction of the vaccine prepared with embryo tissue retarded
the use of brain tissue vaccine if indeed larger quantities had
been available. The reports to date clearly indicate that
vaccination prior to development of an epizootic offers better
protection than vaccination in the face of outbreak.

The comparison of incidence of the disease in vaccinated
and non-vaccinated animals in a given area is difficult since
the exact enumeration of horses and number of cases in an
irregularly outlined region similarly affected by the disease
cannot be accomplished. There is, however, a direct compari-
son between brain tissue vaccine and vaccine prepared with
chick embryo. Results of such a comparison are obviously
in favor of the latter. Only about one-ninth as many chick
vaccine treated animals developed the disease as brain tissue
vaccinated animals when the procedure was executed two
weeks or more prior to the appearance of the first noted
cases. In the case of animals treated during the outbreak
with brain tissue vaccine 8.6 animals per thousand, as con-
trasted with 2.4 animals per thousand in animals given em-
bryo vaccine, contracted the disease. With either product
there is a suggestion that vaccination lessens the severity of
the infection and increases the likelihood of recovery. When
combined with results in controlled experiments, the field
reports lend ample support to preventive vaccination. It is
believed, however, that even so promising a product as this
should not be unduly promoted. There are limitations which
precluded outlining a practical system of application for all
farms. These are matters for individual decision by local live
stock sanitary officials, the attending veterinarian and the
owner, after frank discussion of the entire matter. It has been
suggested that public health authorities may require vaccination in some states where human encephalitis due to equine virus became a problem in 1938. As veterinarians, however, we do have an effective weapon in the chick embryo vaccine for controlling the equine malady. It is evidently superior to the brain tissue vaccine and that was quite generally conceded to be of distinct advantage in prevention.

Other control measures still appear desirable—insect control by every practical means, stabling, good husbandry, and sanitary precautions.

SUMMARY

The 1938 outbreak of equine encephalomyelitis involved 39 states with 79,606 cases and about 21 per cent mortality. Alabama, Georgia, Mississippi, New Hampshire, New York, Pennsylvania, Tennessee, Vermont, and West Virginia reported no cases. Connecticut, Illinois, Kentucky, Maine, Massachusetts, Michigan, Ohio, and Rhode Island experienced the disease for the first time. Virus was recovered for the first time (1938) from Florida, Massachusetts, Illinois, and Ohio. Of the 27 states from which virus has been recovered, only eastern virus has been found in the nine states along the Atlantic coast and only western virus has been positively identified from the states west of the Appalachians. The type of virus occurring in Colorado, Indiana, Louisiana, Nebraska, Ohio, and Wisconsin has not been reported. Other countries, including Canada, Argentine, Brazil, Peru, Chile, Venezuela, Russia, Japan, and India, as well as Panama, have suffered outbreaks of the disease in recent years. Encephalomyelitis virus in the U. S. A. has been found to be immunologically or serologically distinct from those of vesicular stomatitis, St. Louis human encephalitis, herpes, Japanese types A and B encephalitis, poliomyelitis, louping ill, blue tongue, fox encephalitis, vesicular exanthema, and equine infectious anemia.

This year human encephalitis caused by the eastern equine virus was identified in Massachusetts, while human encephalitis caused by the western virus was found in California. The eastern virus was typed by tests in horses.

The following species in addition to the horse have been found susceptible to the western virus: Man, guinea pig, rat, mouse, rabbit, monkey, pigeon, calf, dog, goat, duck, hen, greylag goose, hawk, European blackbird, tawny vulture, stork, mallard duck, ground squirrel, turkey, and guinea fowl. In addition, the following species are susceptible to eastern virus: Cat, sheep, ring-necked pheasant, quail, pig, and European hedgehog.
A study of specimens of wild ducks from an outbreak in Montana which occurred during this year's epizootic of sleeping sickness revealed brain pathology suggestive of that of a virus disease but encephalomyelitis virus was not recovered. Eastern type virus was recovered by Tyzzer, Sellards, and Bennett from naturally infected pheasants and by Fothergill and Dingle from wild pigeons. Investigations to date have failed to demonstrate a carrier state in the recovered horse and likewise virus has not been recovered from blood-sucking insects collected in nature.

Extensive tests on guinea pigs and horses have shown that a high degree of immunity can be produced by formolized chick embryo tissue vaccine. In tests herein reported, two of three horses were protected from an intracerebral exposure three months after vaccination and all of three other horses were protected against a similar inoculation six months after vaccination. The chick embryo tissue vaccine in experimental trials has been found to be definitely superior to the older brain tissue vaccine and its development constitutes a distinct potential advance in the practical prevention of the disease.

REFERENCES

(1) Unpublished Work.
EQUINE ENCEPHALOMYELITIS IN MASS.


PRESIDENT WESTMORLAND: We thank you, doctor. We will proceed with the remainder of the program on this same disease before we enter into any discussion.

The next paper is, "Massachusetts Experiences an Invasion of Equine Encephalomyelitis, Eastern Type," by Hon. Charles F. Riordan, Director, Division of Live Stock Control, Boston, Mass. (Applause.) . . . Hon. Charles F. Riordan read his prepared paper.

MASSACHUSETTS EXPERIENCES AN INVASION OF EQUINE ENCEPHALOMYELITIS, EASTERN TYPE

By Hon. Charles F. Riordan, Boston, Mass.
Director, Massachusetts Division of Live Stock Disease Control

Although my attention had been called more and more frequently during the past two years to articles appearing in the numerous farm journals, veterinary magazines, etc., and, while in attendance at the meeting of this association I had listened to a great deal of talk about a disease of horses called encephalomyelitis, realizing all the while that the disease was occurring over an ever increasing area of the country, apparently working gradually eastward from California where, I understand, the first serious outbreak was reported in 1931, the disease had not until this year been reported in the Commonwealth of Massachusetts; in fact, I believe I am correct in saying that it had not been reported in any part of the northeastern section of the United States.
Now, having been definitely diagnosed, it is believed that isolated cases of the disease had occurred over a period covering several years, not, however, being recognized as encephalomyelitis but called by various names, such as, forage poisoning, botulism, horse tail weed poisoning, etc., death, however, almost always occurring.

On Monday night, August 15, 1938, a veterinary health officer connected with my office called me by telephone and told me he had definitely diagnosed a case of equine encephalomyelitis in Bristol county, a county located in the southeastern section of the state, and that furthermore a considerable number of horses had died in that area during the previous two weeks, many dying without veterinary treatment, while others had been treated for heat stroke, horse tail weed poisoning, etc.

Immediate steps were taken to have brain tissue from horses that died or were destroyed forwarded to the Bureau of Animal Industry at Washington and to other laboratories, and in due time reports were received confirming the diagnosis of equine encephalomyelitis of the so-called eastern type, which, I believe, is the most virulent form of the disease.

We immediately prepared articles setting forth the symptoms of the disease, the precautions to be taken in combating it, such as, screening and sprays, warning against night pasturage, and recommending that all horses not affected by the disease in the infected district be immediately vaccinated.

The daily press of the state printed our story in most cases intact and to their cooperation we are much indebted for causing the people of the commonwealth to become equine encephalomyelitis minded.

The first cases reported, also the majority of those in the state, were confined to the two small counties of Bristol and Plymouth where the terrain is drained by the Taunton River. It was noted in this district, due to the heavy rains and abnormal heat in the month of July, that the area was infested with myriads of mosquitoes. These, no doubt, were the carriers of the disease.

The total horse population of these two counties as of 1937 was reported to be 4,040 and deaths reported as having been caused by encephalomyelitis to date number 164. The reports from the balance of the state diagnosed as true cases of encephalomyelitis number but 103, making the total for the state 267. We doubt if this covers the total number of fatalities in the state from this disease, as reports of losses where no veterinarians had been called in convince us that
the total number that died in the state must approximate very close to 400.

These figures are based on reports received as a result of letters and follow-ups sent out to all registered veterinarians in the state, to the inspectors of animals in each town and city in the state—362 in number—and to persons engaged in the collecting of dead animals, rendering companies, etc.

The finding of this disease in horses attracted the attention of physicians connected with the State Department of Public Health due to the fact that several cases of encephalitis had occurred in persons residing in that same district and led that department and the Harvard Medical School to do some very thorough investigating, with the result that the latter institution was able to obtain virus from the brain of a child that died from encephalitis in Randolph, Mass., which their laboratory later reported as being the true equine encephalomyelitis of the eastern type, and which hitherto we had been advised by all authorities was confined solely to horses and mules. To date, the Harvard Medical School has isolated the virus in eight human cases of encephalitis and in seven of the cases it was found identical with equine encephalomyelitis.

At the request of the State Department of Health, a meeting was called of veterinarians that had been working in the infected district together with doctors connected with the Department of Health, the United States Public Health Service, the Harvard Medical School, entomologists and others, 21 all told. At this meeting the interesting question arose to what other forms of animal life, aside from horses and mules, might harbor this disease. Later at another meeting at the Harvard School of Public Health, which was attended by over a 100 physicians and others interested, it was decided to carry on the research work already in progress to discover what lower forms of animal life, if any, were carriers.

I have with me a colored map showing the towns of the state where cases of the disease were reported. You will note from this map that all these towns are located in the east by southeastern section of the state.

While the first case reported to the Division was on August 15th, we had the situation so well in hand that there was a decided letup in cases reported after August 30th. The total number of cases up to and including August 30th was 167; from that date to September 15th, 85; from September 15th to October 1st, 10; and from October 1st to date, November 15th, 5.
The advent of frost, which was rather late with us this year, assures us that we are through with equine encephalomyelitis for the year 1938.

The total horse population of Massachusetts as of 1937 was but 28,000. We have tried in various ways to get the number of those that were vaccinated. The only information really worthwhile is the fact that 16,000 preventive treatments were sold for use in the commonwealth during that period. Whether this means that 16,000 horses were vaccinated or a lesser number is something we do not know.

From our experience, we have great faith in the so-called chick vaccine, two injections approximately seven days apart being advised. In only a few cases was there a reaction from the use of this vaccine and then only of a mildly alarming character which cleared up in a couple of days. It was also interesting to note that if deaths took place after vaccination they invariably occurred within five days after the first injection.

Another fact is that 98 per cent of cases of encephalomyelitis reported were fatal, greatly in excess of mortality in areas where the condition is caused by the western type of the disease.

While we were advised that aside from the blood-sucking mosquitoes and flies that ticks are suspected as possible carriers of the disease, it is interesting to note that no cases occurred south of the Cape Cod Canal, an area notoriously infested with ticks.

The speedy progress of the disease, as we experienced it in Massachusetts, has been attested by the fact that in the majority of the cases death followed within 24 hours after evidence of the first symptoms.

It is our intention at present, because of the success of the use of the chick vaccine, to advise all horse owners in the commonwealth to vaccinate not later than the early part of June, 1939, and to give at that time such further information as may be learned about the disease.

PRESIDENT WESTMORLAND: Thank you, sir, for your most interesting paper.

We will have the report of the Committee on Miscellaneous Transmissible Diseases, by Dr. Zimmer, Chairman.

DR. F. A. ZIMMER: Gentlemen, your Committee does not have a complete report on miscellaneous transmissible diseases. Our contribution to this program is the two presentations that you have just listened to relating to equine encephalomyelitis. However, Dr. A. W. Miller, of the Bureau of Animal Industry, has prepared a brief report
Dr. Zimmer read his prepared paper.

REPORT OF THE COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES

DR. F. A. ZIMMER, Chairman, Columbus, Ohio.

Dr. W. A. Miller, Washington, D.C. Dr. Edward Records, Reno, Nev.
Dr. A. C. Topmiller, Nashville, Dr. E. A. Watson, Hull, Que., Ont.
Tenn.

The spread of foot-and-mouth disease in European countries, which had its beginning in France in June, 1937, has continued in an ever-widening circle through the present year. This outbreak appeared to have reached its peak in western Europe last spring but, beginning in August, incidence again increased in Belgium and the Netherlands, the disease appearing on more than 8,000 farms in the former during September and about 20,000 farms in the latter during October. Denmark and Switzerland have made strenuous efforts to eradicate the disease but very recent reports show increased incidence. Poland, Czechoslovakia, Hungary and Yugoslavia, which had been entirely or practically free for some time up to a year ago, have experienced extensive outbreaks. The disease has continued prevalent in almost all parts of France and the greater part of Italy. Sweden became reinfected after several years of freedom, as did Lithuania very recently. In Great Britain the most serious spread suffered for many years occurred during the winter and spring. For the first time in a great many years the disease gained entry into the Channel islands. That outbreak was promptly eradicated but in Great Britain sporadic cases have continued to appear. The Union of South Africa has experienced several serious outbreaks after having been completely free for about five years.

In Germany the epizootic did not reach its peak until in August, since which time it has diminished somewhat. On September 15 there were about 100,000 infected farms as against 136,000 on September 1 and 150,000 on August 15. Between August 1, 1937, and September 15, 1938, the disease made its appearance on 592,000 farms in that country.

Finland and Estonia are now the only countries in Europe that are apparently free from foot-and-mouth disease. Fortunately, all the countries of North and Central America and the West Indies, as well as several South American countries bordering on the Caribbean have continued free from this disease. This also is true of New Zealand, Australia and Japan.

In Asiatic countries and other countries of Africa and South America, where the disease is enzootic, reports indicate that conditions are about the same as in previous years.

It is reported that research workers in Germany have developed a new vaccine that produces immunity lasting from three to four months, which it is stated has been used to some extent with apparently good results. However, the maximum production of this vaccine was only 3,000 liters per week, which, of course, is entirely inadequate to provide protection for animals in any considerable areas. For that reason, and possibly others, veterinary authorities in other
countries where the disease is a serious problem have expressed doubt as to its practical value in combating an extensive epizootic. In Germany large quantities of convalescent serum also were used in their efforts to reduce losses incident to the epizootic.

This report will be referred to the Executive Committee.

PRESIDENT WESTMORLAND: That is a splendid report, Dr. Zimmer, and will be referred to the Executive Committee.

This completes our work for this afternoon. The Executive Committee will meet immediately.

The meeting is adjourned.

. . . The meeting adjourned at 4 o'clock.

** ADJOURNMENT **

FRIDAY MORNING, DECEMBER 2, 1938

The meeting convened at 9:25 o'clock, President D. E. Westmoreland presiding.

PRESIDENT WESTMORLAND: The meeting will please come to order. We will devote our efforts this morning to papers and discussion on transmissible diseases of poultry.

The first paper on the program will be "Progress in Pullorum Disease Control and Eradication," by Dr. Henry Van Roekel, Department of Veterinary Science, Massachusetts State College, Amherst, Massachusetts. (Applause.)

. . . Dr. Van Roekel read his prepared paper.

** PROGRESS IN PULLORUM DISEASE CONTROL AND ERADICATION**

*By Henry Van Roekel, Amherst, Mass.*

*Department of Veterinary Science, Massachusetts Agricultural Experiment Station*

Pullorum disease is recognized as a great economic problem to the poultry industry in this country. The causative agent of the disease was discovered nearly 40 years ago. Since that time there has been a growing interest in the combat of this disease. Research contributions have paved the way for our approach in controlling and eradicating this infection in our poultry. The discovery of the cycle of infection directed special attention to the control and elimination of the disease. In 1914 the macroscopic agglutination test was applied for the detection of adult "carriers" of the infection. It was realized at that time that the only real basis for improvement among breeding flocks was to detect and to eliminate all infected

*Contribution No. 324 of the Massachusetts Agricultural Experiment Station. Presented at the Forty-Second Annual Meeting of the United States Livestock Sanitary Association, Chicago, Ill., November 30 and December 1-2, 1938.*
birds. With this fundamental objective in mind great progress has been made in combating pullorum disease.

The macroscopic agglutination test is the most valuable means at our disposal for the control and eradication of the disease. However, its effectiveness is only as great as the efficiency of the methods employed and the competency of the person conducting the test. These facts were obvious in the minds of those persons who organized the Conference of Laboratory Workers in Pullorum Disease Eradication in 1928, for the purpose of improving methods and standardizing technique employed in pullorum disease testing, as well as bringing about a greater uniformity of interpretation of results. It was recognized also that the agglutination test represented only an integral part of a control and eradication program. Other fundamental disease control and eradication measures were regarded essential for an effective eradication program. Today these originators of the New England Conference may feel justly proud of their contribution to the solution of the pullorum disease problem because the original conference now includes 15 states and one Canadian Province, all of which are sponsoring an active testing program. The accomplishments of this conference have exerted a definite beneficial influence on pullorum disease eradication in this country. It appears desirable for states in other sections of this country to organize similar conferences to investigate and discuss their immediate problems for the purpose of expediting pullorum disease eradication in their respective localities.

Progress in combating pullorum disease cannot be anticipated unless an effective control and eradication program is adopted and executed. One must first consider sound fundamental measures which are basic for control and eradication of all infectious diseases. Secondly, one must have a thorough knowledge of the disease in question in order to apply specific measures of control and radication. Thirdly, one must regard the industry's economic status in the different areas as well as other factors such as husbandry practices and facilities for the execution of a control and eradication program.

Since pullorum disease is infectious and communicable in character it must be recognized that the infection may be disseminated as long as infected individuals or infective objects are permitted to have direct or indirect contact with susceptible stock. A full comprehension of the pullorum disease cycle with all its possible ramifications points out that
successful combat against the disease calls into play sound elimination and prevention measures. The following measures have been found very effective in Massachusetts.

1. All birds on the premises should be tested annually.

2. If infection is present, the entire flock should be retested within four to six weeks until a negative report is obtained, provided the value of the birds justifies the expenditure for testing.

3. Every reactor, regardless of its value, should be removed from the premises and sold for slaughter immediately upon receipt of the report.

4. The poultry houses, runs and equipment should be thoroughly cleaned and disinfected immediately after removal of reactors. An empty pen in each house may facilitate cleaning and disinfection during winter months. Disinfectants approved by the United States Department of Agriculture should be used.

5. Offal from all birds dressed for market or home consumption as well as dead birds that are not fit for consumption should be burned.

6. Birds removed from the premises to egg-laying contests, exhibitions, etc., should be held in quarantine and determined free from disease before they are re-admitted into the flock.

7. Purchase of stock in the form of adults, chicks and eggs should be from officially recognized pullorum disease-free flocks.

8. Eggs should not be saved for hatching until after a flock has been tested and all the infected birds removed. Early pullet testing will permit early hatching.

9. Fresh and infertile eggs from unknown or infected sources should not be fed to chickens or exposed to other animals that may carry or spread the infection.

10. Poultrymen should not custom-hatch for untested or infected flocks.

11. Owners of pullorum disease-free flocks should not have hatching done where infected eggs or stock may be found.

12. Poultrymen should not buy feed in bags that have been used or exposed to infection. (Such bags if properly disinfected will be safe for further use.)

13. Poultrymen should not use equipment that has been exposed to or contaminated with infective material unless properly cleaned and sterilized or disinfected.
Since time does not permit further consideration of each of these measures only the most important ones have been selected for discussion.

The importance of testing all birds on the premises cannot be overemphasized. To determine the true status of a group of individuals, all individuals must be examined or tested. If one or more untested birds remain in the flock, trouble may arise from pullorum infection. Testing results show that only one reactor may be detected in flocks of considerable size. If such a bird should escape the test, accidentally or otherwise, and if retained on the premises, it may serve as a reservoir of infection which has possibilities of being disseminated.

Annual testing is necessary in view of the fact that infection has made its appearance in flocks previously negative. Breaks have been detected annually among tested flocks, as shown in Table I. As long as pullorum clean flocks are located in areas with untested and infected flocks, which may permit either direct or indirect contact between the two groups, we may anticipate dissemination of the disease. This situation should stimulate an interest in area control and eradication of the disease. In Tables II and III the results of annual testing of flocks show a much greater progress in the establishment and maintenance of pullorum clean flocks than is the case with flocks tested intermittently (one year and not the next) or flocks tested for the first time.

### TABLE 1

**Flock Information on "Breaks"**

<table>
<thead>
<tr>
<th>Explanation for Infection</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>1936</th>
<th>1937</th>
<th>1938</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of stock from untested flocks</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Introduction of stock from tested infected flocks</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Eggs hatched at poultry plants with infected flocks</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Birds returned from egg-laying contests</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Combination of sources</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>23</td>
</tr>
</tbody>
</table>

**No. of Consecutive Years Non-Reacting Previous to Break**

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
</table>

**Total Breaks**

|                | 9    | 7    | 7    | 5    | 3    | 5    | 2    | 3    | 42     |

**Total number of 100% negative flocks the previous year**

|                | 220  | 230  | 185  | 185  | 185  | 184  | 233  |

**Percent of breaks**

|                | 4.25 | 3.33 | 3.69 | 3.45 | 1.92 | 3.07 | 1.09 | 1.09 |
The establishment of a pullorum clean flock by means of intensive retesting (testing at four week intervals) and the prompt removal of reactors has been found practical and suc-

<table>
<thead>
<tr>
<th>Classification</th>
<th>Flocks</th>
<th>Birds</th>
<th>Total Tests</th>
<th>Percent Positive Tests</th>
<th>Percent Non-Reacting</th>
<th>Percent of Birds in Non-Reacting Flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested for the first time</td>
<td>599</td>
<td>2,589,662</td>
<td>2,589,662</td>
<td>278,340</td>
<td>3.03</td>
<td>66.78</td>
</tr>
<tr>
<td>Intermittent testing</td>
<td>223</td>
<td>1,577,233</td>
<td>1,577,233</td>
<td>162,734</td>
<td>1.05</td>
<td>75.09</td>
</tr>
<tr>
<td>Two consecutive years</td>
<td>478</td>
<td>3,268,892</td>
<td>3,268,892</td>
<td>355,504</td>
<td>1.10</td>
<td>77.42</td>
</tr>
<tr>
<td>Three or more consecutive years</td>
<td>1,770</td>
<td>11,214,343</td>
<td>11,214,343</td>
<td>2,604,425</td>
<td>0.37</td>
<td>88.93</td>
</tr>
</tbody>
</table>

**TABLE 2**

Nine-Year Testing Summary of Massachusetts Flocks.

**TABLE 3**

Comparative Testing Data of Flocks Tested for the First Time and Flocks Tested for Three or More Consecutive Years.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Flocks</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
</tr>
<tr>
<td>Tested for the first time</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
</tr>
<tr>
<td>Tested for three or more years</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
<td>112</td>
</tr>
<tr>
<td>Total Birds</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
</tr>
<tr>
<td>Tested for the first year</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
</tr>
<tr>
<td>Tested for three or more years</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
<td>145,802</td>
</tr>
<tr>
<td>Percent Positive Tests</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Tested for the first year</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Tested for three or more years</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Percent of Flocks Non-Reacting</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Tested for the first year</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Tested for three or more years</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

In Massachusetts it has been observed that when a careful testing program is carried out, pullorum infection can be eliminated from flocks through retesting within one testing season. Table IV gives the results of retesting. The prompt removal and proper disposal of reactors is exceedingly important in the eradication of the disease.

In viewing the baby chick industry as a whole in this country, it is apparent that baby chicks are dispensed from different types of sources. In the New England section the bulk of the chicks are hatched and sold by the breeder-hatcher. However, in other sections the chicks often are hatched in and distributed from custom and commercial hatcheries. Chicks from these latter sources are subjected to infection more often than chicks dispensed by a breeder-hatcher. A conscientious breeder-hatcher who has gone
through the expense of establishing and maintaining a pullorum free flock will also exercise every effort to prevent the introduction of infection in his incubator so as to deliver pullorum-free chicks to his customers. In other words, the breeder-hatcher has control of all the operations that are involved in the production of chicks and he realizes that his success depends upon the quality product that is placed before the public. The custom hatcher or commercial hatcher has control in most instances only over his hatching operations and little or no control over the breeding stock. The owner of the breeding stock may have only a passing interest in the commercial hatchery. Furthermore, a custom or commercial hatchery usually receives its hatching eggs from more than one flock owner, hence increasing the factor of human error or negligence in disseminating pullorum disease.

In Massachusetts, custom and commercial hatcheries in the past have been responsible for distributing pullorum infection. However, it is possible for both custom and commercial hatcheries to dispense only pullorum-free stock, which is being done in a number of states at the present time. This has

**TABLE 4**

Retesting Data of Ten Infected Flocks.

<table>
<thead>
<tr>
<th>Flock Number</th>
<th>First Test</th>
<th>Second Test</th>
<th>Third Test</th>
<th>Fourth Test</th>
<th>Fifth Test</th>
<th>Results of Subsequent Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>189</td>
<td>152</td>
<td>48</td>
<td></td>
<td></td>
<td>467</td>
</tr>
<tr>
<td></td>
<td>1.59</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>369</td>
<td>256</td>
<td>218</td>
<td></td>
<td></td>
<td>232</td>
</tr>
<tr>
<td></td>
<td>0.54</td>
<td>0.39</td>
<td>0.00</td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>125</td>
<td>96</td>
<td>91</td>
<td></td>
<td></td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
<td>4.08</td>
<td>0.00</td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>243</td>
<td>252</td>
<td>223</td>
<td>179</td>
<td></td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>11.11</td>
<td>1.45</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>464</td>
<td>444</td>
<td>433</td>
<td>397</td>
<td></td>
<td>1,057</td>
</tr>
<tr>
<td></td>
<td>2.37</td>
<td>0.45</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>6</td>
<td>1,765</td>
<td>1,559</td>
<td>1,508</td>
<td>1,108</td>
<td>767</td>
<td>1,796</td>
</tr>
<tr>
<td></td>
<td>3.17</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>7</td>
<td>2,079</td>
<td>1,929</td>
<td>1,611</td>
<td>1,048</td>
<td>1,337</td>
<td>2,132</td>
</tr>
<tr>
<td></td>
<td>3.17</td>
<td>1.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>8</td>
<td>704</td>
<td>661</td>
<td>61.0</td>
<td>422</td>
<td></td>
<td>693</td>
</tr>
<tr>
<td></td>
<td>6.24</td>
<td>8.83</td>
<td>0.16</td>
<td>0.00</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>9</td>
<td>2,722</td>
<td>2,143</td>
<td>2,284</td>
<td>1,929</td>
<td></td>
<td>3,707</td>
</tr>
<tr>
<td></td>
<td>1.40</td>
<td>0.56</td>
<td>0.48</td>
<td>0.00</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>10</td>
<td>510</td>
<td>440</td>
<td>399</td>
<td>352</td>
<td>339</td>
<td>747</td>
</tr>
<tr>
<td></td>
<td>27.34</td>
<td>4.32</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
been made possible through the establishment of an abundance of pullorum-free flocks from which these hatchery own-
period there has been a marked increase in the number of tested birds; a definite reduction in the average percentage
ers can select with great scrutiny. State agencies concerned
with pullorum disease control and eradication should encour-
age hatcherymen to select eggs only from flocks known to be
free from the disease.

In areas where few pullorum-free flocks exist and where
the practice of hatching chicks in custom and commercial
hatcheries prevails, it is proposed that a carefully planned
disease eradication program be outlined and applied to flocks
whose owners are conscientiously interested in the execution
of such a program. It is suggested that the flocks of these
cooperating owners be subjected to an intensive retesting
program until two consecutive negative tests have been ob-
tained. Flocks with such a rating or higher should then be
used for supplying pullorum clean chicks to replace infected
flocks. It should be emphasized that these chicks should be
hatched on premises where eggs from untested or pullorum
infected stock do not exist.

If an intensive retesting program is considered too costly
for the establishment of pullorum clean flocks, then one can
resort to the replacement of the infected flocks with officially
recognized pullorum clean stock. With the modern method
of transportation there appear to be no areas in this country
which are inaccessible for the importation of pullorum clean
stock. In the practice of replacing flocks with such clean
stock, one must realize that the diseased animal is being re-
placed by a susceptible individual. Hence the success in
maintaining a non-infected flock depends upon whether or not
the environment for the flock is and remains free from infec-
tion. The replacement of infected flocks with pullorum clean
stock should be adopted more generally in our efforts to con-
trol and eradicate the disease.

In the testing of flocks for pullorum disease, one should rec-
ognize that all reactions obtained do not necessarily represent
pullorum infection. In Massachusetts paratyphoid and fowl
typhoid infected flocks have been detected in our routine test-
ing for pullorum disease. Furthermore, the detection of only
doubtful reacting birds in a previously non-reacting flock
should not be sufficient evidence to condemn the flock as pull-
orum infected. Each year necropsies of doubtful reacting
birds detected in previously negative flocks have revealed that
seem justifiable to the owner who highly values a non-react-
ing test. In such instances, it is advisable to supplement the
agglutination test with necropsies and bacteriological exam-
ination in order to establish an accurate flock diagnosis.

In the control, eradication and prevention of pullorum dis-
ease the poultry industry should recognize that the domestic
chicken is not the only host susceptible to this infection. Sev-
eral species of fowl, especially the turkey, have suffered heavy
losses from the disease. In many instances the source of the
infection is directly or indirectly traceable to infected chickens
by way of the incubator or brooder. Infected mature turkeys
may also eliminate the organism in the egg. If such eggs
were used for hatching, it seems plausible that infected poult
may result. In the light of our present knowledge of the dis-
ease it would seem expedient to prevent the incubation and
hatching of eggs from untested or infected flocks with eggs
from pullorum-passed and pullorum-clean flocks, irrespective
of the species of fowl concerned.

TABLE 5
Eighteen-Year Testing Summary of Massachusetts Flocks.

<table>
<thead>
<tr>
<th>Classification</th>
<th>1920-21</th>
<th>1926-27</th>
<th>1932-33</th>
<th>1937-38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total flocks tested</td>
<td>108</td>
<td>249</td>
<td>335</td>
<td>308</td>
</tr>
<tr>
<td>Total number of birds tested</td>
<td>24,716</td>
<td>127,327</td>
<td>296,093</td>
<td>480,227</td>
</tr>
<tr>
<td>Total number of tests</td>
<td>24,716</td>
<td>127,327</td>
<td>296,093</td>
<td>480,227</td>
</tr>
<tr>
<td>Positive tests (percent)</td>
<td>12.50</td>
<td>4.03</td>
<td>0.47</td>
<td>0.17</td>
</tr>
<tr>
<td>Percentage of total tested flocks non-reacting</td>
<td>23.15</td>
<td>45.78</td>
<td>82.39</td>
<td>92.85</td>
</tr>
<tr>
<td>Percentage of total tested birds in non-reacting flocks</td>
<td>9.77</td>
<td>31.63</td>
<td>80.41</td>
<td>95.26</td>
</tr>
</tbody>
</table>

In states where an effective control and eradication pro-
gram has been carried on over a period of years, definite
progress in the establishment and maintenance of pullorum-
free flocks is observed. Table V gives an eighteen year test-
During the past few years a growing interest in pullorum disease control and eradication has been manifested in this country. The combat against pullorum disease is recognized by the National Poultry Improvement Plan. According to a recent report from the United States Department of Agriculture, 41 states are participating in the pullorum disease phase of the Plan. Twenty-three of these 41 states recognize only the lowest grade (pullorum-tested) of three grades set up in the Plan. Chicks produced from “pullorum-tested” flocks may on the whole exhibit higher livability than chicks from untested flocks. However, losses from pullorum disease are not eliminated as is the case in chicks originating from flocks free from the disease. Agencies in charge of the control and eradication of pullorum disease in the various states should strive to encourage flock owners and hatcherymen to have their flocks and chicks meet the requirements of the two higher grades as recognized by the National Plan. This phase of the pullorum disease problem may in part be met through an extensive cooperative educational program participated in by all agencies interested in pullorum disease control and eradication.

PRESIDENT WESTMORLAND: Due to the absence of Dr. Jungherr, the next paper will be given by Dr. C. L. Martin, of the University of New Hampshire, Durham, New Hampshire. Its title is, “Wheat Germ Oil in the Control of Fowl Paralysis,” by Dr. Erwin Jungherr, Professor of Animal Pathology, Connecticut State College, Storrs, Connecticut.

(Appause.)

. . . Dr. Martin read the prepared paper by Dr. Jungherr.
WHEAT GERM OIL IN THE CONTROL OF FOWL PARALYSIS AND KINDRED DISEASES

By Erwin Jungherr, Storrs, Conn.

Department of Animal Diseases, Storrs Agricultural Experiment Station

Fowl paralysis has come to be recognized during recent years as one of the principal causes of adult poultry mortality. The ordinary form of the disease which is characterized by asymmetric paresis and thickening of peripheral nerves in growing birds is of real economic importance. Evidence has accumulated that lymphomatous tumors, similar diffuse infiltrations of the visceral glands and frank leukemias belong to the same general group which constitutes an important factor in adult mortality. In this discussion will be included, therefore, not only fowl paralysis in the sense of neurolymphomatosis, but also lymphomatous tumors and the various forms of avian leukosis.

Compared with ordinary infectious diseases, little success has been attained in the control of fowl paralysis. Orthodox sanitary measures (quarantine and slaughter) have not given the desired results. Long-time control programs by selective breeding of old stock, while successful in some instances, have met with considerable practical difficulty. With this situation as a background, the recent announcement by Butler and Warren (6) on the preventive and curative effect of wheat germ oil in fowl leukosis has given rise to widespread hope and speculation. Time has not been sufficient to obtain conclusive data on the efficacy of the treatment, notwithstanding over-enthusiastic advertising on the part of some commercial companies. The problem is of interest and importance to the entire poultry industry; a critical discussion at this time may help to clarify certain fundamental points involved.

As will be pointed out, there are numerous ramifications to the question. To conserve space, it is proposed here to discuss the subject briefly, from three major angles; first, a comparison between the pathology of leukotic diseases and vitamin E deficiencies; second, experimental treatment of fowl paralysis with wheat germ oil; and third, field observations.

COMPARATIVE PATHOLOGY

Leukotic diseases. The pathology of leukotic diseases of the fowl has been discussed repeatedly before this Associa-
tion; a brief statement will suffice here. Beginning with neurolymphomatosis gallinarum, as fowl paralysis was defined originally (30), it will be recalled that this disease is characterized by lymphoid and plasma cell infiltration in peripheral nerve trunks, and to a lesser degree in spinal cord, brain and iris. It is frequently associated with visceral infiltrations or lymphomatous tumors, but the blood picture usually remains unaltered. The leukemias in the more restricted sense, also called leukoses on account of variability in blood involvement, are subdivided into an erythro-myelogenous and a lymphogenous form, both of which are characterized by autonomous proliferation of the respective cell types of the hematopoietic system. Lymphogenous leukosis is also called lymphomatosis and comprises the neural and visceral forms as morphologic varieties. The leukotic diseases of the fowl, except hepatolymphomatosis, of which the status is uncertain, have been found transmissible by cell-free filtrates and are, therefore, considered to be due to a filterable "virus." Whether all forms are caused by the same virus or whether they are due to related strain-specific viruses is not definitely known.

The avian leukoses find their pathologic counterpart in mammals. The leukemias, especially those which are related to man, have been reviewed recently in monographic form by Richter (34) and Forkner (16). They have been observed in dogs and sheep. Lymphomatosis in cattle appears to have become an economic problem in certain countries. Experimental leukemia has been studied particularly in mice and guinea pigs. In contrast to avian leukoses, the mammalian diseases are transplantable only by viable cells. On the other hand, mammalian as well as avian leukoses are characterized by widespread rapid and disorderly proliferation of the leukocytes and their precursors (16). A similar autonomous behavior of pathologic cells is found in neoplasms. This has given rise to the concept of the leukemia-complex corresponding to "cancer of the blood" (27).

**Vitamin E deficiency.** Until recently vitamin E was not available in pure form (36), so that most of the studies dealt with the preventive effect of natural vitamin E concentrates, of which wheat germ oil is the outstanding representative. In addition to the antisterility factor, wheat germ oil has been credited with containing a growth-promoting factor (12, 28) for young rats, and a substance essential to the central nervous system of adult rats (11). Vitamin E deficiency has also been considered a factor in the muscular dystrophy of herbi-
vora (23), guinea pigs, rabbits (17) (25) (26) and adult rats (15), and in the post-natal paralysis of young rats which develops when the mother’s intake of the vitamin is restricted (14).

The well known researches of Evans and Burr (13) have laid the groundwork for the present pathologic concept that lack of vitamin E in the diet leads to embryo-resorption in pregnant females and to degenerative changes in the testes of the male. The pathologic process in the male rat was characterized by Mason (24) as chromatolysis and fusion of mature spermatozoa followed by degeneration of secondary spermatocytes. In the male fowl, Adamstone and Card (2) found loss of the osmiophilic refractile bodies in mature spermatozoa and later progressive degeneration in their precursors. Chronic E deficiency in older rats causes paralysis which has been ascribed to degeneration of the cross-striated musculature (15) and of the dorsal nerve roots, and to ganglion-cell reduction in the ventral horns of the spinal cord (11).

Lack of vitamin E in the chick embryo, according to Adamstone (1), leads to early degeneration of the vascular system and, by the fourth day of incubation, to a mesodermal cellular reaction which, like a “lethal ring,” chokes off the circulatory system and causes death of the embryo.

Of especial interest are the disorders of young animals fed simplified E-deficient diets because they are characterized by definite, frequently gross-pathologic alterations. Young rats born from females on certain E-low diets develop a paralysis (14) which is due to dystrophy of the skeletal muscles. The pathologic process is characterized by Zenker’s degeneration and edema, followed by secondary cellular reaction and basophilic regeneration (29). The condition is preventable by wheat germ oil (14) given either to the mother or the nursing offspring.

In young birds E-deficient simplified diets bring about pathologic syndromes which seem to affect different tissues in various species. Ducklings (32) react in a manner similar to that of young rats, namely by developing a dystrophy of the skeletal muscles; chicks (31) show severe cerebellar edema and hemorrhages known as nutritional encephalomalacia, the counterpart of “crazy chick disease” in the field (20); and young turkeys develop a degenerative myopathy of the (involuntary) gizzard muscle (21). The diets used are known to be low in vitamin E, and vegetable oils and concentrates known to contain vitamin E have a protective action in these
diseases. Further experiments are necessary, however, to establish these diseases as manifestations of vitamin E deficiencies.

At variance with the pathologic picture of vitamin E deficiencies described above, is the report by Adamstone (3), who observed the occurrence of "lymphoblastoma" in young birds kept on a diet which had been treated with ferric chloride to destroy vitamin E (37), and pointed to the resemblance of the lesions to those of fowl leukosis. The pathologic process was initiated, however, by degenerative alterations, the observed cellular proliferation being perhaps secondary in character. The identity of these lesions with avian leukosis is difficult to accept because they have not been seen in several thousand experimental chicks on E deficient diets, their transmissibility has not been shown, and they lack the characteristic histologic features of spontaneous avian lymphomatosis. The lesions described and the illustrations suggest an inflammatory condition. It is interesting to note here that Rowntree and his associates (35) claimed to have produced spindle cell sarcoma in rats by feeding a crude wheat germ oil product obtained by ether extraction, but could not do so with refined products.

A summary comparison of the pathology of leukotic diseases and vitamin E deficiencies indicates, therefore, that leukotic diseases are characterized by autonomous proliferation of hematopoietic elements, while E deficiencies, like other avitaminoses, are primarily characterized by degenerative processes of selected tissues. Thus, there is no known pathologic basis for assuming a specific anti-leukotic property of wheat germ oil.

EXPERIMENTAL

Probably one of the first reports on experimental treatment of fowl paralysis was that of Bayon (4), who obtained some success by forced feeding of lettuce or watercress. Wilcke et al (38) investigated systematically the nutritional aspects of fowl paralysis and concluded that the course of the disease was not influenced by high or low levels of vitamins or minerals in the feed. Castle et al (8) were unable to obtain any experimental support in man, for the idea that chronic leukemia was a deficiency disease. Following the announcement of the wheat germ oil treatment (6), Davidson and Schaible (10) added 5 per cent wheat germ meal to the laying ration, but did not find any difference in the incidence of leukosis between treated and control lots. In a preliminary report Jungherr (22) stated that treatment of fowl paralysis with
wheat germ oil under controlled laboratory conditions has not shown any beneficial effect. A similar conclusion was reached by Blakemore (5) in England and Cole (9) in this country. Therapeutic claims for wheat germ oil in other infectious diseases, such as Bang's disease (18), also have not been substantiated.

In the author's studies on the problem the first phase under consideration was the question of how to administer the treatment. Originally (6) both parenteral and enteral applications were advised, and on the strength of this recommendation poultrymen were supplied by some companies with wheat germ oil and syringes for injection purposes. Repeated intraperitoneal and intramuscular injections were tried by the writer in doses ranging from 1 to 4 cc., but it was soon found that intraperitoneal injections cannot be given with impunity for any length of time. As intramuscular injection of the breast muscles would be the method of choice, observations were made as to time necessary for resorption of the inoculum. It was found that doses as low as 1 cc. were not resorbed completely after a period of five weeks. Larger doses produced at the site of injection pockets filled with fatty material of soft creamy consistency, not unlike pus. The walls of the pocket consisted of a dense connective tissue capsule which made ultimate complete resorption very doubtful. From the standpoint of meat hygiene, such birds would be classified as unfit for food on account of the objectionable appearance of the breast meat. Wheat germ oil was therefore administered for the most part per os with a pipette.

Another phase of the problem was the development of experimental methods which would give reasonable assurance of obtaining reliable data. Since fowl paralysis frequently produces gross lesions in the ovary, liver or sciatic nerve, direct examination of these organs is feasible by exploratory operation or biopsy. The method has been applied, especially to the ovary, and can be further developed. A fairly large number of birds must be examined on account of the variability in gross lesions.

A second method is that of using pairs of birds comparable in stock, breed and age, and matching the two according to the degree of clinical symptoms; one member of the pair is used for treatment and the other one as control. Both are subject to gross and histopathologic examination at the end of the experiment. Fowl paralysis is a disease of such mani-
fold manifestations that "at random" controls have little meaning in a therapeutic test.

RESULTS

All treatments were carried out with a recently obtained sample of wheat germ oil which was kindly supplied by the Archer Daniels Midland Company and stored in an electric refrigerator. Four young birds which on exploratory operation were found to be affected with incipient lymphomatosis of the ovary were subjected to partial ovariectomy followed by treatment for 4-5 weeks. To illustrate these experiments, the protocol of one of these birds follows: 11 weeks old female BR, clinically normal 4-8-38; one-half of tumorous ovary about 11x6x3 mm. in diameter removed; treatment 1 cc. wheat germ oil intramuscularly for five days; 2 cc. per os for six days and 4 cc. for 16 days, a total of 81 cc; 6-16-38, lively, but wings droopy, sacrificed. Autopsy findings: site of injection fistulous tract 30x9 mm.; lobulated ovarian tumor 42x40x25 mm., right and left sciatic nerves show microscopic lymphoid infiltrations; ovarian lymphoma, indistinguishable from biopsy specimen. The results suggested that the treatment neither inhibited the growth of the ovarian tumor nor prevented the development of the paralytic symptom.

Six other BR crosses 11 weeks old were obtained from an outbreak of fowl paralysis and subjected to treatment. All of them showed some degree of locomotor disturbance at the time of admission; one of the birds was treated with 33 cc. of wheat germ oil over a period of 18 days and then died; the other five birds received each 81 cc. during 39 days. In two of the birds temporary clinical alleviation of the symptoms could be noted; when sacrificed at the end of the experiment, all five remaining birds showed gross pathologic evidence of fowl paralysis.

A group of 50 twelve-weeks old BR birds similar as to stock, feed and management became available for experimental treatment. The birds were obtained from an affected broiler lot, and divided according to the "matched pair method." Fourteen died soon after arrival at the laboratory from fowl paralysis. There remained 20 birds in the treated and 11 in the control lot. Five birds in each group failed to show either clinical or pathologic evidence of fowl paralysis; of 15 clinically affected birds in the treated group 14 were found to be affected with fowl paralysis, on pathologic examination, whereas in the control group the ratio was 10 birds
affected out of a group of 11. Treatment was carried on with
doses of from 20 to 76 cc. of wheat germ oil over periods
of from 10 to 28 days. The paralysis in this flock was of the
lymphomatous type, with both visceral and neural manifes-
tations. The postmortem findings were confirmed by histo-
logic examination. According to these experiments no dif-
fERENCE could be observed in the incidence of fowl paralysis
between the treated and the control group.

FIELD OBSERVATIONS

As far as the author is aware, no detailed field observations
have been published on the efficacy of wheat germ oil in the
control of fowl paralysis. Laboratory records collected up
to this time at Storrs indicated the occurrence of seven dif-
f erent outbreaks of fowl paralysis in flocks given commercial
feeds containing approximately 3 to 4 ounces of wheat germ
oil per ton. Four of these outbreaks affected chicks two
to three months old which had been fed vitamin E-fortified
rations since the day of hatching; the other three cases oc-
curred in mature birds on fortified laying rations.

Butler, Warren and Hammersland (7) prepared a second
report on their experience with the nutritional control of
fowl leukosis. Thanks to the courtesy of Dr. Butler, the
writer was permitted to see the interesting manuscript be-
fore publication. It should be pointed out here that clinico-
 hematologic diagnosis cannot be considered as a diagnostic
criterion of avian leukosis (19). One is impressed by the
fact that evaluation of the treatment was based by Butler
primarily upon decreased mortality and increased production.
Irregular incidence of fowl paralysis and apparent improve-
ments in affected flocks without any special treatment are
well known, so that the causal relationship of the treatment
to the incidence of fowl leukosis does not seem established.
The suggested dosage of 4 pounds of wheat germ oil (plus
10 pounds of cod liver oil) per ton of feed is considerably
higher than the commercial recommendations of about 4-8
ounces, which makes for difficulty in comparing field obser-
vations.

On the other hand, Butler and his associates unquestiona-
ibly obtained improvements in the general health of flocks
suffering from a high incidence of leukosis, by fortifying
the basal rations with fresh vitamin-carrying oils. This
would suggest that under certain conditions the addition
of fresh wheat germ oil and cod liver oil may be a valuable
nutritional supplement.
Treatment of older birds where the pathologic process has become arrested may be apparently successful in certain cases, due either to spontaneous recoveries or perhaps to the central nervous system-protective factor in the wheat germ oil.

The existence of a specific antileukotic effect of wheat germ oil cannot be considered established from field observations. In the present state of our knowledge there is likewise no justification for making the hypothetical antileukotic effect of wheat germ oil the basis of sales campaigns.

**SUMMARY**

The problem of the effectiveness of wheat germ oil in the control of fowl paralysis and allied diseases is discussed from three points of view, namely comparative pathology of leukotic diseases and E-avitaminoses preventable by wheat germ oil, methods and results of experimental treatment, and field observations.

It is pointed out that avian leukosis is characterized by autonomous proliferation of various components of the hematopoietic system; although differing in transmissibility, mammalian leukemias show a similar underlying process.

The pathology of diseases occurring on vitamin E-low diets is, as far as known, characterized by selective degeneration of certain body tissues, sometimes associated with secondary reactions. The following examples are cited: regressive disturbance of spermatogenesis in the testes of the rat and fowl; disintegration of the vascular system followed by a cellular reaction of the mesoderm in the chick embryo; skeletal muscular dystrophy of guinea pigs, rabbits, ducklings, and adult and young rats; encephalomalacia of chicks and ventricular myopathy of the smooth muscle in turkeys. The only exception to the general rule that E-avitaminoses cause selective degeneration is the reported occurrence of a tumor-like “lymphoblastoma” in chicks fed a ferric chloride-treated diet in which E presumably is destroyed. But the identity of this syndrome with avian leukosis is doubtful, because it has not been seen in several thousand experimental chicks fed E-low diets, its transmissibility has not been shown, and it differs histopathologically from spontaneous leukosis.

In therapeutic experiments involving 60 birds it was observed that wheat germ oil injected intramuscularly is not properly resorbed and is, therefore, contra-indicated from a practical standpoint. Two critical methods were evolved; (a)
exploratory operation and biopsy of sites which frequently show gross lesions; (b) the use of pairs of birds similar in constitution and matched according to clinical symptoms, one member of which serves as control. Intensive treatment of 24 young birds shown to be affected with fowl paralysis at autopsy, over periods ranging from 10 to 39 days, did not indicate any beneficial effect on the course of the disease. The dosage administered to individual birds was almost as large as that recommended for preventive treatment of a ton of feed. Similar unsuccessful results have been reported from Great Britain and from this country.

Field observations are as yet incomplete and difficult to evaluate, on account of the absence of valid criteria. There are variations in the recommended dosage of wheat germ oil from about 3 ounces to 4 pounds per ton. Clinico-hematologic data or apparent flock improvements are not sufficient to establish the causal relation of the treatment to the disease.

From the three points of view, no valid reason seems to exist to assume a specific antileukotic property of wheat germ oil. Since wheat germ oil has been shown to contain an antisterility, a growth promoting, and a central nervous system-protective factor, in addition to its anti-oxidant effect, it constitutes a valuable supplement in cases of nutritional deficiencies involving these factors.

REFERENCES


---

PRESIDENT WESTMORLAND: Thank you, Dr. Martin, for delivering this paper for Dr. Jungherr.

The next paper is, "Immunization of Canaries Against Canary Fowl," by Dr. A. J. Durant, Department of Veterinary Science, University of Missouri, Columbia, Missouri. (Applause.)

DR. A. J. DURANT: Mr. Chairman and Members of the Convention: I will say at the beginning that the title of my paper has been...
INVESTIGATION OF POX IN CANARIES

By A. J. Durant and H. C. McDougle, Columbia, Mo.
Veterinary Department, University of Missouri

The canary, according to Alexander Wetmore (1), is found today in every country on the globe and is kept and reared solely for the pleasure and companionship that it brings into our home with the exception of a few commercial uses as the detection of carbon monoxide in coal mines.

In the wild state the canary (Serinus canaria canaria) is native to three groups of islands in the eastern part of the Atlantic ocean, the Canary Islands, from which it takes its name, Madeira and the Azores and are the stock from which all of our domestic canaries have come. These birds have no relation to the so-called “wild canaries” of America.

According to Wetmore, Turner in 1544 is the earliest writer known to have mentioned the canary.

It is estimated by some that the canary population may be equal to one-twentieth of the human population of the United States.

It is only in recent years that much attention has been given to the study of diseases of canaries and it is somewhat of a surprise to find how serious and wide-spread certain diseases are today in America. Particular study has been given by the authors to two diseases of canaries, leucosis (2) and canary-pox, both of which cause a heavy mortality in the canary industry.

In the case of canary-pox during the past year reports have been received of three outbreaks in which 300 canaries were lost in each of two aviaries and at least 150 birds in the third aviary. In addition, other reports were received of heavy losses in smaller groups. The disease apparently occurs in cycles of about 21 days in the young. The mortality is nearly 100 per cent of all birds affected. In one case of natural infection in our experimental birds a canary survived the disease and apparently had developed a solid immunity, of a virulent virus failed to produce any lesions or symptoms
of the disease. Two other birds were reported to have recovered from the disease in one of the large avaries.

Kikuth and Gollub (3), in 1932, described a disease of canaries encountered in the course of chemo-therapeutic studies on bird malaria. The disease was capable of passing a Berkhfeld filter (M) but not a Seitz disc. The injection of infective blood produced in four or five days general symptoms, apathy, loss of appetite and ruffling of the feathers, and within a further two or three days the bird quietly died.

Burnett (4), in 1933, confirmed in general the findings concerning Kikuth’s virus and concluded that it was a member of the bird-pox group, but based this conclusion on the following grounds: “The skin over the inoculated area showed thickening of the epithelium, with most of the cells containing cytoplasmic inclusions closely resembling the Bollinger bodies of the fowl-pox. The virus particles were large, about 17 microns in diameter and like fowl-pox the virus retained its activity well on keeping. Lesions were produced on the chorio-allantoic membrane of the developing egg showing a general resemblance to those of fowl-pox. Finally one strain of fowl-pox among several tested produced on intramuscular inoculation into the canary an infection with a longer incubation period than but otherwise pathologically similar to that produced by Kikuth’s virus.”

During the course of our experiments 22 canaries, two turkeys, 14 chickens two sparrows, three quail, and two pigeons were used. Of this group only the canaries and turkeys showed a market reaction to the strain of canary virus used. The chickens showed a less marked reaction and only in younger birds was a reaction noticed. Chickens six to eight months of age did not show a reaction.

Since there does not appear to be a clear description of the clinical symptoms of canary pox in natural outbreaks it seems advisable to include them in this paper. The first noticeable symptom in a bird is that it will start wiping its beak across the perch as though trying to remove a mucus from the nostrils, then scratching the side of the head and neck with its toes and opening the mouth and twirling the tongue with a sort of gagging as if swallowing. Following these symptoms a slight inflammation of one or both eyes appears. Sometimes the initial symptoms in the birds will be gaping or gasping for breath. This continues until about the 14th day, then the birds succumb. In other canaries lesions under and around the beak are first noticed. Sometimes the inflammation starts around the eye in which case swelling
and inflammation closes the organ (Figures 1 and 2). These symptoms are accompanied by fever. The feathers will be fluffed up and the birds will sit motionless on the bottom of the cage and gradually wilt. Sometimes death is due to inanition. Some fanciers report that lesions always start in the left eye. This was noted in an aviary where 126 birds were lost out of 200 birds.

The postmortem findings of birds affected with this disease in general are the same as in chickens affected with fowl-pox with one exception. In canaries the external lesions are practically always found affecting the entire body. The nature of the lesions on the skin are slightly different where they occur on the feathered parts of the body. This is well illustrated in Figure 2. Pox lesions are discreet, usually round, white tinged with yellow containing a serous pus-like material. The scab formation is not as distinct as in chicken-pox though in advanced stages there is a tendency toward this condition.

The internal lesions of canary-pox are similar to those of chicken-pox with the formation of cheesy exudates in the commissures of the mouth and entrance to the larynx.

Microscopic studies of stained sections from canary-pox virus lesions in canaries, chickens and turkeys showed distinct differential characteristics. In the sections from canaries (Figure 2) numerous typical virus inclusion bodies are present with very few if any polymorphonuclear eosinophils with rods. In the section from chicken lesions there are no virus inclusion bodies evident and only a few polymorphonuclear eosinophils with rods. In the case of turkeys the sections show a marked infiltration of polymorphonuclear eosinophils with rods with small bodies resembling virus bodies which are usually seen in the canary pox or fowl pox lesions. These are observed only in the deeper tissues and are not shown in the illustration.

In all three of the birds involved the sections taken on the fifth day showed a graded epithelial and connective tissue proliferation with accompanying syndrome of inflammation in all three cases except for the lack of polymorphonuclear eosinophils with rods in the sections from the canaries.

Burnet (4) and Lush state that "Inoculation of canary virus is invariably fatal to canaries and produces no lesions in the fowl." The author's investigations indicate that there is a distinct skin tissue reaction in young chickens, turkeys and quail. These results were obtained by removing feathers
from the feather tracts on the breast and scarifying the surface of the skin without producing hemorrhage, then applying the virus to this area.

Chickens, turkeys and quail when inoculated with canary pox virus, though fairly typical gross lesions are produced, later when inoculated with fowl-pox virus will develop typical lesions, indicating that no immunity to the fowl-pox virus had been developed by exposure to the canary-pox. This would seem to indicate that canary-pox virus is a different type of virus with a different degree of virulence for other bird species than the canary. This tends to confirm the findings of other investigators, and though the results in general are similar, the actual differences of results obtained from the two investigations might be explained on the basis of methods of application of virus to the birds and possibly amounts and strain of viruses used.

Because a few birds recovered from a natural attack one of which was demonstrated to be protected as a result of the disease, it occurred to the authors that it might be possible to prepare a vaccine from the canary-pox virus that when properly applied would protect canaries against this disease. Further emphasis was given to the possibilities from the striking results which have been obtained in the control of fowl-pox in chickens. The vaccine was applied to the feather follicles similar to the method used in the application of the fowl-pox vaccine. The canaries, however, did not appear to develop any noticeable degree of resistance from this method since 30 days later when a virulent virus was applied to a large scarified area on the skin of the breast, all developed the disease and died, but hope of yet producing a form of immunity by vaccination should not be given up since other successful means may be devised which will protect canaries against this fatal disease.

**SUMMARY**

1. Canary-pox causes severe losses in canaries throughout the United States.
2. The disease in most cases is fatal to infected birds, the death occurring quite regularly from the 10th to the 14th day after exposure.
3. The canary-pox virus does not immunize other birds against a fowl-pox virus.
4. Turkeys inoculated, with canary-pox show a marked tissue reaction but the turkey remained otherwise healthy.
5. One canary, recovered from a natural case, did not de-
A canary affected with a natural case of canary pox, showing the external lesions surrounding the base of the beak and the eyes.
The same bird as in Fig. I, after death. The feathers have been removed to show the lesions over the feathered parts of the body.
A photomicrograph of a section through the skin of a canary affected with canary pox. The virus inclusion bodies are numerous in the light area in and near the feather follicle near the center of the picture.

Magnified X 296.
velop the disease when the canary virus was applied to a scarified defeathered area on its chest.

6. Attempts to produce a vaccine to protect canaries against canary-pox were unsuccessful.

REFERENCES


METHOD AND PRACTICAL APPLICATION OF EGG PROPAGATED AVIAN VIRUSES

By G. L. DUNLAP, Pearl River, N. Y.

In 1931, Woodruff and Goodpasture (1) showed that certain filterable viruses would grow and multiply on the chorio-allantoic membrane of a developing chicken egg. Rous and Murphy (2) first used this medium in 1911 for the propagation and study of a neoplasm of adult chickens. Since the report of Woodruff and Goodpasture, there has been a mass of published data on this technic so that at the present time about 25 of the filterable disease causing agents have been grown in the developing egg. Some of these however have not been confirmed. This is a comparatively new field of endeavor, and consequently there are many points which have not been satisfactorily explained, but at the same time many facts concerning the nature, growth, destruction and preservation of certain of the viruses have been established. This technic offers a very convenient, economical method for such virus studies as optimum growth temperatures, longevity or preservation, titration, neutralization and the effects of the action of chemicals on the viruses.

METHODS

Since this paper deals with the avian viruses only those of fowl and pigeon pox and infectious laryngotracheitis will be discussed.

Probably the first hazard for the research worker in this technic is the isolation of pure bacteria-free strains of virus.
This is an absolute necessity as most bacteria grow more rapidly than the virus, obscuring the virus lesions as well as yielding a membrane low in virus content.

Woodruff and Goodpasture (1) record three methods for obtaining pure fowl pox virus free of bacteria. The first method consists of tryptic digestion of early pox lesions which liberates the pox inclusion body which in turn is picked up and washed by means of the Chamber's micropipette. The washed pox bodies are then introduced on the chorio-allantoic membrane of a suitably prepared developing egg. The second method consists of introducing the virus intradermally and after 6-8 days incubation and before the pox vesicle is broken down, the chicken is killed, the area bathed in alcohol and with sterile instruments the lesion is excised and the core removed from the dermal surface. Part of the core or scrapings can be tested for the presence of bacteria and if absent the remainder can be used for egg inoculum. This procedure may require more than one passage to obtain a bacteria free inoculum. In the third method of isolation, pox infected material is digested with trypsin and then treated with 1 per cent potassium hydroxide for 24 hours which kills the bacteria, but occasionally molds will survive this treatment.

There have been a number of modifications of these three methods. One modification worthy of note is that of Bierbaum and Gaede (3) which consists of introducing the virus intracerebrally into pigeons or chickens and after 8-12 days incubation the bird is destroyed, the brain removed aseptically and passed through another series if not bacterially sterile.

Beaudette and Hudson (4) find these methods not entirely satisfactory for isolation of pigeon pox virus since the pox are invaded by bacteria at an early stage. They resort to filtration through a Berkefeld V filter with success.

The isolation of bacteria free virus of laryngotracheitis from tracheal exudate does not present any great difficulty as the virus may be quite readily filtered through Berkefeld N or V filters in sufficient concentration to infect developing eggs.

**PREPARATION OF THE EGG**

The age of developing egg best suited for this method of culture is between the 10th and 13th day of incubation. Bur- net (5) states that for the study of inclusion bodies the 10 day eggs are best suited, while for virus production 11 or 12 day eggs are preferred. The source of eggs should be from...
a healthy vigorous flock of hens free from any recognizable
disease, and mated to vigorous males to insure strong well
developed embryos. Small weak embryos resulting from poor
stock or from faulty incubation management are unsatisfactory
for this work since in many instances the operative
procedures alone are sufficient to kill the embryos before
enough time has elapsed for the development of virus lesions.

There are two general methods, with modifications, for
preparing the eggs for the inoculation of virus. The Brandly
(6) method consists of introducing the inoculum, through a
hole in the normal air cell, between the innershell membrane
and the chorio-allantois. This procedure insures the virus
being held in intimate contact with the cells of the chorio-
allantois with greater subsequent chances of infectivity.

The Burnet (5) method, with its modifications, consists in
the production of an artificial air cell which is accomplished
by first drilling a hole into the normal air cell and a second
hole is drilled at the high point of the egg when held hori-
zontal to its long axis. At this point a hole is pricked in the
outer shell membrane but care must be exercised not to punc-
ture the chorio-allantois which is in intimate contact with
the shell membrane. Slight negative pressure applied at the
hole in the normal air cell will cause the chorio-allantois to
drop and the egg contents to partially occupy the space of
the normal air cell. This artificial air cell can easily be seen
under proper lighting conditions. The inoculum is then in-
troduced directly on the ectodermal layer of the chorio-allan-
tois in this artificially produced air cell.

After the virus containing inoculum has been introduced
the holes are covered with either a cover glass or cellophane,
held in position with melted wax or paste, or cellulose tape,
to prevent air contamination and excessive evaporation. The
eggs are then incubated at the normal incubation tempera-
ture which is also a favorable temperature for the develop-
ment of the poxes and laryngotracheitis viruses.

TIME OF HARVEST

Brandly (7) has shown that the most favorable time for
harvesting laryngotracheitis infected membranes is about the
third day at which time the virus has reached its maximum
growth. After the third day the virus content gradually di-
minishes. For the maximum yield of fowl pox virus the mem-
brances should be harvested by the fourth or fifth day. Bea-
dette and Hudson (4) found that if pigeon pox infected eggs
were allowed to incubate until about hatching time the virus
content was practically nil.
PRACTICAL APPLICATIONS

The production of virulent virus-vaccines on the susceptible tissues of birds is always accompanied by dangers from secondary bacterial and virus contamination unless extreme precautions are taken in the selection of the stock and the proper safety tests applied to the finished product. To date no spontaneous virus or bacterial diseases of eggs have been detected providing the source of the eggs has been carefully considered. It is apparent then that virus grown in eggs has the distinct advantage over the host tissue prepared virus in not being subjected to possible secondary pathogens. Furthermore the concentration of egg propagated virus can be accurately titrated and even though the chorio-allantois has been shown to be more susceptible to pox and laryngotracheitis viruses than the tissues of susceptible birds, the method is convenient and economical in establishing and maintaining a uniform standard product.

It has been shown by Brandly and Dunlap (8) that in the case of fowl and pigeon poxes the egg propagated viruses are capable of producing "good takes," with subsequent immunity, in higher dilutions than with skin propagated virus-vaccines. Their results showed virus concentrations from ten to one thousand-fold greater in the egg type virus than in the skin prepared virus.

Comparative titrations of skin propagated and egg propagated fowl and pigeon pox viruses at our laboratory have shown similar differences in virus content. The results of these titrations are summarized in the following table.

| TABLE 1 |

Summary of results of titrations of eggs and skin propagated fowl and pigeon pox viruses.

<table>
<thead>
<tr>
<th>Materials—</th>
<th>Birds Vaccinated</th>
<th>Birds Showing Good Takes</th>
<th>End Point* Dilution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg Propagated</td>
<td>4</td>
<td>1-100,000</td>
<td></td>
</tr>
<tr>
<td>Fowl Pox</td>
<td>8</td>
<td>1-500,000</td>
<td></td>
</tr>
<tr>
<td>Skin Propagated</td>
<td>4</td>
<td>1-5,000</td>
<td></td>
</tr>
<tr>
<td>Fowl Pox</td>
<td>8</td>
<td>1-10,000</td>
<td></td>
</tr>
<tr>
<td>Egg Propagated</td>
<td>4</td>
<td>1-10,000</td>
<td></td>
</tr>
<tr>
<td>Pigeon Pox I</td>
<td>10</td>
<td>1-50,000</td>
<td></td>
</tr>
<tr>
<td>Egg Propagated</td>
<td>2</td>
<td>1-100,000</td>
<td></td>
</tr>
<tr>
<td>Pigeon Pox II</td>
<td>8</td>
<td>1-10,000</td>
<td></td>
</tr>
<tr>
<td>Skin Propagated</td>
<td>4</td>
<td>1-50,000</td>
<td></td>
</tr>
<tr>
<td>Pigeon Pox</td>
<td>10</td>
<td>Less than 1-1,000</td>
<td></td>
</tr>
</tbody>
</table>

* Dilutions used: 1-1,000 1-50,000 1-5,000 1-100,000 1-10,000 1-500,000
The titrations were made on susceptible birds using the feather follicle method by applying the virus dilutions at different sites, utilizing the right side of the bird for egg propagated virus and the left side for skin propagated virus. This procedure should tend to minimize individual bird differences so far as possible. The dried virus suspensions were prepared in dilutions of 1-1,000; 1-5,000; 1-10,000; 1-50,000; 1-100,000; 1-500,000 and applied as soon as possible after preparations. The takes were read on the seventh and ninth post vaccination day and recorded according to degree of reaction. The vaccinated areas showing at least a "three-plus" reaction were taken as the arbitrary end point. There was evidence of virus activity in some of the inoculated follicles beyond this end point however. The results of these titrations indicate the consistently higher virus content of the egg propagated virus over the skin propagated virus.

Considerable research needs yet to be done particularly on the standardization of the virus. This is especially true of fowl pox since a vaccine which is capable of producing "good takes" in a dilution of 1-500,000 or higher might be too virulent to use at our present standards. There is no information available which establishes the proper virus content for a satisfactory vaccine for field use. Approximately 0.5 per cent suspensions of dried fowl pox skin lesions have been adopted through extensive field trials, as a standard, but weighed amounts of fowl pox virus-containing material is no indication of its virus content.

The propagation of the avian viruses on developing eggs gives us a convenient, economical and superior method of producing large quantities of material with a high virus content as well as a tool for the accurate measurement of the virus content. With this new method of culture, however, we need additional information on the preservation and standardization of the different viruses.

Of the other viruses which cause distinct pathological entities in avian species and which have been successfully cultivated in developing eggs the following might be mentioned; infectious bronchitis; Newcastle Disease; fowl plague; Kikuth's canary virus; sparrow pox; psittacosis and Pacheco's parrot disease. Some of these diseases are not indigenous to the United States while others that are present have not reached serious economic consideration.

REFERENCES


Vice-President Axby took the Chair . . .

CHAIRMAN AXBY: Dr. Dunlap, we certainly appreciate this discussion on the method and proper application of egg propagated avian viruses. I am sure we are all more interested in this now that we have the opportunity to be enlightened on it.

Next is the report of the Committee on Transmissible Diseases of Poultry, by Dr. George E. Corwin, Chairman.

DR. GEORGE E. CORWIN (Connecticut): Mr. Chairman, may I take this opportunity to thank the members of the Committee who have so kindly offered suggestions as to the preparation of this report. I also wish to thank the speakers whom we have heard this morning, for their able preparation and fine presentation of their subjects.

. . . Dr. Corwin read the report of the Committee on Transmissible Diseases of Poultry.

REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY

DR. GEORGE E. CORWIN, Chairman, Hartford, Conn.

Dr. Erwin Jungherr, Storrs, Conn. Dr. Robert Graham, Urbana, Ill.
Dr. J. R. Beach, Berkeley, Calif. Dr. C. L. Martin, Durham, N. H.
Dr. E. L. Brunett, Ithaca, N. Y. Dr. A. J. Durant, Columbia, Mo.

This year your committee on Transmissible Diseases of Poultry wishes to call your attention again to some of the newer problems in poultry disease control which came to the forefront during the period covered by this report. Knowledge of poultry disease problems is advancing rapidly and we find that in a report of this nature it will be rather difficult to discuss all problems in detail or to any great extent. The program which has been arranged and presented deals with advanced knowledge on the respective subjects.

PULLORUM DISEASE CONTROL PROGRAM IN THE NATIONAL POULTRY IMPROVEMENT PLAN

The unification and standardization of the pullorum disease control program achieved under the National Poultry Improvement Plan must be considered a great step in advance. It has been especially helpful in clarifying the terminology used in connection with various grades of poultry, although general agreement has not been reached on the testing methods due to regional differences.
The question of testing turkeys and other species of domesticated birds has been brought up frequently in connection with the general eradication program as applied to the common fowl. At present the serologic testing of turkeys for pullorum disease is incompletely understood and the inclusion of this species in the National Improvement Plan, on a similar basis as the common fowl, is considered inadvisable. In turkeys the whole blood test is considered unreliable and reactions in the tube agglutination in dilutions below 1:50 seem to be non-specific.

Young turkeys are highly susceptible to incubator and brooder infection from infected chicken material. In some cases, adult turkeys show a tendency to recover from the infection as indicated by failure to isolate the causative organism from serologically positive reactors, in other cases it appears that pullorum disease can become established in adult turkeys and transmitted through the egg.

In connection with the general blood testing program the use of fowl typhoid mixed bacterins in flocks under test for pullorum disease, may give rise to suspicious reactions not indicative of pullorum infection and should, therefore, be avoided.

**VIRUS DISEASES AND THEIR CONTROL**

During the last two years considerable advances have been made in production of certain virus vaccines for the control of specific poultry diseases of viral origin by means of propagating them on the chorion-allantois of incubating eggs. This facilitates standardization of dosage and exclusion of contaminants, a subject which has been discussed in more detail in a paper which forms a part of this program.

Due to the known specificity of virus diseases, virus vaccines have a highly specific action. The basis of their effectiveness is, therefore, conditioned by accurate diagnosis for which adequate facilities should be made available. The use of a live virus vaccine not indicated by the diagnosis may be instrumental in introducing a new disease hazard into the flock. In some territories stringent regulatory measures are applied to certain virus diseases; a wrong diagnosis may, thus, place undue hardship on the owner.

**EPIDEMIC TREMOR**

Recent experience in the northeastern territory indicates that the disease is on the increase and is becoming a definite economic problem. The condition is considered to be due to a filterable virus and occurs in a paralytic, clonic mixed and possibly a latent form and therefore an early diagnosis is difficult and can be solved only by histologic examination of the central nervous system. This method of diagnosis is important and indispensable in all non-microbial forms of clinical “paralysis” in poultry.

The work of Dr. E. E. Jones of the Harvard Medical School in co-operation with Martin, Bottorff and Tepper of the University of New Hampshire has laid the ground work for the present concept of the disease. The transmissibility of the condition was recently confirmed and extended by Van Roekel, Bullis and Clarke, who demonstrated that fresh hatching eggs inoculated with virus-material produced epidemic tremor-affected chicks, which suggests the possibility of an egg-borne infection.

**FOWL PARALYSIS AND TUMOR COMPLEX**

Fowl-paralysis was originally defined as neurolymphomatosis on account of the characteristic involvement of the nervous system but
is now considered by some authors as a subgroup of lymphomatosis which also comprises the visceral manifestations. Lymphomatosis belongs to the group of avian leukemia, which exhibit some features characteristic of malignant neoplasms. Opinions differ on the cause of avian leukemia but a number of investigators believe that this group of diseases is due to a virus-like agent or to several agents, which are transmissible by injection, contact and perhaps through the egg.

This group of diseases constitutes the most important single factor in adult mortality in the United States.

In the control of fowl leukemia, favorable field results have been reported by Butler and his associates with the use of wheat germ oil in the diet, but have not been confirmed by laboratory methods, but on account of its importance to the poultry industry, the question of dietary control deserves further study. A plea is made to make exact observations in obtaining the answer in order to prevent possible exploitation.

EQUINE ENCEPHALOMYELITIS IN BIRDS

The widespread outbreaks of this disease of both the eastern and western type in 1938 have emphasized its importance not only to the livestock breeders concerned immediately but also to human health. Most recently, Tyzzer, Sellards and Bennett reported the occurrence of eastern type virus in the wild pheasant and thereby extended the list of known susceptible birds such as chicken, turkey, pigeon, stork, duck, goose, etc. Thus birds may constitute an important natural reservoir of the disease.

NUTRITIONAL DISEASES

Major advances have been made in recent years in the analysis of nutritional disorders of birds through the recognition and, in some cases, through the chemical isolation of nutritional factors necessary for the well-being, health and reproduction of the birds. Among the better understood substances, vitamins A, D and E, thiamin, riboflavin and the chick antidermatitis factor are considered indispensable. The last mentioned vitamin has recently been differentiated from the rat acrodynia factor B. The necessary blood-coagulating factor vitamin K—although rarely lacking in practical poultry rations—is of great theoretical interest in general physiology. Gizzard erosion or so-called “ulcerated gizzard,” a common condition in brooder chicks, was considered to be due to the lack of a specific vitamin-like factor; newer work by Almquist and Mecchi suggests that the syndrome may be brought about by any condition that interferes with the normal secretion or flow of bile in which cholic acid appears to be the important principle.

As shown by the use of certain simplified diets, young chicks need also the fat soluble antiencephalomalacic factor, lack of which is responsible for so-called “crazy chick disease” in the field. The factor is present in wheat germ oil and other vegetable oils and seems to be different from the antiparalytic factor B4, of which the status is uncertain. Whether there exists also a water soluble antiparalytic factor aside riboflavin is controversial.

From a practical standpoint the accurate diagnosis of nutritional disorders which are not characterized by a definite gross-pathologic picture, meets with difficulties because (a) one is often dealing with deficiencies due to multiple factors, and (b) with partial deficiencies with indefinite symptoms and lesions. By histologic examinations an
accurate diagnosis can often be made which may be of importance in chick mortality on account of the transmission of partial deficiencies through the egg.

**ADULT MORTALITY**

With reference to the causes of mortality in adult birds, the outstanding importance of leukotic diseases has already been mentioned. The relative predominance of filterable virus, bacterial, protozoan, parasitic, fungus and nutritional diseases varies in different localities so that no general statement is indicated. No general surveys of the occurrence of the respective diseases are available, but most of the official poultry diagnostic laboratories publish yearly reports of the findings in specimen submitted for laboratory diagnosis; however, these findings do not necessarily indicate the conditions actually existing on the farms.

**AVIAN TUBERCULOSIS**

Avian tuberculosis is widely distributed in some sections especially the Mid-Western and Pacific states. It is an infectious disease of poultry, which is of economic importance for domestic birds in so far as its transmissibility to other species is concerned. It would seem desirable that tuberculosis is eradicated from poultry flocks in order to eradicate it from other susceptible species of animals.

**MYCOSIS**

The term indicates infection by various fungal organisms and does not in itself signify an etiologic entity. Fungal diseases seem to be on the increase in certain states, especially California, Missouri and Kansas.

There occur two common forms, aspergillosis due to Aspergillus species, which affect primarily the respiratory tract, and moniliasis, or thrush, caused by Monilia albicans, which affect the upper digestive tract.

Wild turkeys, quail and chukar partridges raised in confinement as well as domestic turkeys are very susceptible to both forms. Domestic turkeys are frequently affected with moniliasis. Adult chickens are apparently quite resistant to both forms.

Monilia albicans is most frequently found in moldy grain, which, if so infected, causes heavy losses. Poultrymen should be urged to protect properly feed from becoming damp, either before it leaves the feed sacks or after it is put into the feed hoppers. The diagnosis of mycosis should be confirmed by competent laboratory officials in order to prevent a false diagnosis often made for the apparent purpose of selling unnecessary medicants.

**DUCK SEPTICEMIA**

Duck Septicemia due to Pfeifferella anatipestifer originally, recognized in New York state by Hendrickson and Hilbert has recently been found to be the cause of a highly fatal disease of ducks in Illinois, by Graham, Brandly and Dunlap.

**COMMENT**

A word should be said about the indiscriminate sale of poultry biologics and poultry remedies. There is considerable stock of information available on the scientific control of poultry diseases and official diagnostic laboratories are available in practically every state for service to livestock control officials, veterinarians and poultrymen.
High pressure advertising and so-called field service by unscrupulous agents prevents the poultryman in many cases from contacting the proper authorities and from obtaining adequate information and advice. More progress has been made in poultry pathology than any other line of medicine because most of the advice is arrived at by modern scientific diagnosis. But still advertising campaigns stand often like a barrier between the available free facilities and the poultrymen suffering the losses, and are instrumental in adding an extra expense to economic losses exacted by poultry disease problems upon the industry.

This report, Mr. Chairman, has been signed by five of the seven members of this Committee, two of the Committee members not being present. They are all aware of the contents of this report. I submit this to you, and ask that it be submitted to the Executive Committee for further action.

CHAIRMAN AXBY: The report will be referred to the Executive Committee. Dr. Corwin, we thank you and all the members of your Committee for this most excellent report, which is more particularly characterized by being so complete, expressing the knowledge right up to this very minute so far as scientific knowledge on transmissible diseases of poultry is known.

This concludes all of the items under the section of the Committee on Transmissible Diseases of Poultry.

The next subdivision is the Committee on Parasitic Diseases. First on the program is “Newer Knowledge of Poultry Parasites,” by Dr. J. E. Ackert, State College of Agriculture and Applied Science, Manhattan, Kansas. (Applause.)

. . . Dr. Ackert read his prepared paper.

NEWER KNOWLEDGE OF Poultry PARASITES*†

By JAMES E. ACKERT, Ph. D., Manhattan, Kan.
Professor of Zoology, Agricultural Experiment Station Parasitologist and Dean of the Division of Graduate Study, Kansas State College of Agriculture and Applied Science

A wide range of new material has been contributed in recent years to our knowledge of poultry parasites. Progress has been made in the control of certain parasitic diseases, and added information upon intermediate hosts of tapeworms has made possible for the first time large scale investigations of the effects of tapeworms upon their hosts. In the field of the fowl nematodes, methods have been developed which will aid in determining the food and the nutritional requirements of intestinal parasites. This information will be valuable in the

†Contribution No. 201 from the Department of Zoology, Kansas State College of Agriculture and Applied Science.
treatment and control of fowl helminthiasis. In reviewing the field, emphasis will be placed upon internal parasites of chickens.

**PROTOZOAN PARASITES**

The most important protozoan disease of chickens is coccidiosis. While several species may affect chickens, two species, *Eimeria tenella* and *Eimeria necatrix* are more likely to produce fatal coccidiosis than are the other species. *Eimeria tenella* confines its attack to the ceca or blind guts, whereas, *Eimeria necatrix* attacks the epithelial lining of the small intestine. Young birds from two to eight weeks of age are harmed most by these parasites and the majority of the fatal cases occur during these ages. Older chickens may also be affected but they are more frequently able to build up a host tolerance and subsequently act as carriers, distributing coccidial cysts wherever they go. This is what makes necessary the rearing of the young chickens on clean ground, or gravel runs, or upon screen. The gravel runs, due to their failure to hold moisture do not provide a suitable medium for the incubation of the coccidial cysts, a stage which must be developed in the soil in order that the oocysts may become infective for the next chicken host.

Other control measures include strict sanitation and frequent scalding of drinking utensils.

Some progress has been made in the treatment of chickens suffering with coccidiosis. The Wisconsin station (1) has found that the feeding of small amounts of sulphur (flowers of sulphur) will greatly reduce coccidia infestation and that two per cent will affect the cecal parasites and be practically harmless to the chickens. In this connection, it is interesting to note that the Wisconsin station (2) found that an excess of oyster shell would weaken the body defenses against the coccidia. Commercial oyster shell fed in amounts of 2 to 6 per cent made the chickens markedly more susceptible to coccidiosis. In the matter of control, however, evidence is still available that the California buttermilk ration (3) is effective as a treatment for coccidiosis, especially when used in the proportions of 40 parts dried buttermilk, 30 parts yellow corn meal, 20 parts ground barley or shorts, and 10 parts wheat bran. This ration should be fed for a week or 10 days with no other food except plenty of fresh clean water. After treatment, the birds should be returned gradually to the regular ration. This treatment should be given two or three times at weekly intervals as the organisms within the epithelial cells are not affected by it.
During the year, there has been discovered a new species of malaria parasites that is pathogenic for domestic fowls. Coggeshall (4), by taking blood from a Borneo pheasant in the New York Zoological Park and injecting it into young chickens secured infestations of a new malarial parasite. The organism which was named *Plasmodium lophurae* proved to be pathogenic to young chickens of the Rhode Island Red, White Leghorn, and Brahma varieties. As a possible transmitting agent of the new parasite, a preliminary test showed that the mosquito, *Aedes aegypti*, could become infected by feeding upon the blood of the infested chickens. The complete cycle, however, was not determined.

The last of the protozoan diseases to be considered is trichomoniasis. Both chickens and turkeys may be attacked by these trichomonad organisms. *Trichomonas pullorum* may produce a fatal disease of baby chicks and *T. diversa* a disease of turkeys. The birds show a catarrhal inflammation of the mouth, esophagus, crop, and proventriculus. Closed eyes, ruffled feathers and depressed appetite are other symptoms. Loss of weight and diarrhea occur in the final stages. Losses in young chickens may be very severe. Young turkeys of various ages may be affected as well as the older birds. Post mortem examinations have shown severe inflammation of the crop wall and ulcer-like areas from the crop to the proventriculus. These lesions are quite characteristic for the turkey.

As control measures, the Kansas station (5) recommends a copper sulphate solution (1 to 2000) in place of the drinking water for two weeks after the outbreak starts. This together with sanitation to reduce reinfection has controlled the disease satisfactorily.

**TAPEWORMS**

Chickens in this country may be infested with seven species of tapeworms. Of this number, four are rather large and may be of common occurrence. All of the fowl tapeworms require intermediate hosts to grow their larval stages. Prior to recent years, these intermediate hosts were known to consist of snails, earthworms, or flies. In no case did any of these invertebrates develop a large number of larvae or cysts at one time. Hence it was not possible to infest a large number of chickens for experimental studies. In 1928-32, the Zoological Division of the United States Bureau of Animal Industry (6), (7), and (8), demonstrated that certain ground beetles might serve as intermediate hosts of the fowl tapeworm *Raillietina cesticillus*. This was followed by work in
Germany (9) and at the Kansas station (10) with the results that many species of beetles *Coleoptera* have been found to be suitable intermediate hosts of this tapeworm and a few as secondary hosts of *Choanotaenia infundibulum*. These two, *R. cesticillus* and *C. infundibulum*, probably are the most common chicken tapeworms in the United States. For the latter species, house flies may be a more usual intermediate host.

The recent exposure of 20 growing chickens to naturally infested house flies resulted in 15 of the chickens becoming infested with from one to 28 tapeworms (*C. infundibulum*) in five weeks. Examinations of flies trapped near the exposure cage showed the tapeworm larvae in their body cavities. As beetles were excluded from the cage, it is evident that house flies are still important intermediate hosts of this chicken tapeworm.

As hosts of the other two large tapeworms, *Raillietina echinobothrida* and *R. tetragona*, two species of ants were implicated in an announcement by the Zoological Division (11). Recent studies on the smallest fowl tapeworm, *Davainea proglottina*, at the Cornell Station (12) have shown a relationship between host feeding and proglottid formation. Reduced rations resulted in decreased segment shedding showing that the tapeworm is dependent upon the host’s food for its well being.

The treatment of fowl taeniasis is still in a rather unfavorable state. Results from giving kamala are inconstant. Sometimes, good results have been obtained by giving fifteen-grain tablets of crude kamala to vigorous mature chickens, seven and one-half grain doses to immature or weak birds. At other times, the results appear to be quite unsatisfactory. The Kansas Station (5), apparently the first to use copper sulphate as a taeniacide, has removed many tapeworms by using a one to 2000 solution of copper sulphate (one level teaspoonful to each five gallons of water), this solution to be used instead of drinking water. Workers in this field should also be familiar with the iodine preparation of Chandler (13). The iodine vermicide is administered directly into the gizzard in dosage corresponding to the age and size of the birds. For the control of intestinal worms of poultry, one of Chandler’s products, called iodine suspensoid, is claimed to destroy worms and eggs on floors and in soil.

Other control measures of chicken tapeworms will involve reduction of the numbers of house flies by trapping and by the frequent spreading out of manure or the tight covering.
of manure and garbage receptacles, and by the removal from the borders of poultry yards loose boards, stumps, and all other trash which furnishes hiding places for the ground beetles that have access to tapeworm proglottids passed by the fowls.

**EFFECT OF TAPEWORMS ON CHICKENS**

The discovery of beetles as intermediate hosts of chicken tapeworms has made possible rather large scale experiments for determining the effects of tapeworms upon chickens. As many as 626 cysticercoids were developed in the body cavity of one beetle at Manhattan, Kansas (14). Even today, there is much difference of opinion about the effects of the beef tapeworm, *Taenia saginata* upon man. One group holds that the detrimental effects of human tapeworm infestation are due more to worry from the knowledge of having a tapeworm than to the tapeworm itself; another, that tapeworms may be injurious. For the last two years, experiments have been conducted at the Kansas Station (15) to determine effects of the tapeworm *Raillietina cesticillus* on chickens. By feeding tapeworm proglottids collected from fowl droppings to beetles grown some distance from poultry yards, it has been possible to secure at one time many hundreds of cysticercoids or larvae of the tapeworm. In this way, chickens from the same hatch were infected and the balance of the hatch kept as control chickens. Up to the present, the results indicate that growing chickens that have received 50 or more cysticercoids when infested for two months show reduced amount of blood sugar and lowered percentage of hemoglobin. Infestations of only three weeks did not show lowered hemoglobin. In both the eight-week and the three-week infestations, the chickens showed reduced rates of gain. A similar reduction in gain in weight was shown by work at the Zoological Division (16) which was carried on concurrently. The reduced blood sugar and lowered hemoglobin secured at the Kansas Station appear to be here reported for the first time as effects of tapeworms on a host.

Work completed last year at the Kansas Station (17) on fowl tapeworm studies also showed for the first time that fowls develop age resistance to tapeworms. Chickens 2.5 to 4 months of age were markedly more resistant to the growth and development of tapeworms than were chickens of the same breed at two months of age.

This finding raised the question of whether adult chickens may be infected with tapeworm larvae. If older chickens are more resistant than younger ones, will the adult fowls be-
come infected if they swallow beetles containing the cysticercoids? To test this point, four mature chickens raised parasite free were fed 100 cysticercoids of the tapeworm *R.cesticillus*. Two chickens from the same lot were kept in the pen as controls. In from 12 to 85 days, the parasitized chickens passed gravid proglottids. On post mortem, they were found to contain from 4 to 50 tapeworms. Both control chickens were negative. The results thus showed that adult chickens may become infested by swallowing the larval tapeworms (18).

Observations of the effects of tapeworms on chickens at the Kansas Station indicate that the most deleterious effects from tapeworms may come after rather long periods of infestation. While more tests are needed, much evidence is available to show that an infestation of fowl tapeworms over periods of four to eight months may cause the host to lose weight and strength and to develop a more or less paralyzed condition which finally results in death. Post mortem examinations fail to show any causative factors other than the presence of the tapeworms.

**ROUNDWORMS**

Most of the parasitic roundworms are able to complete their life cycles without the aid of a secondary host, but certain groups, like the tapeworms, require a host for the development of the larval stage. Such a worm is Manson's eye worm *Oxyspirura mansoni* which lives within the eye membranes of fowls. Its principal intermediate host seems to be a cockroach (*Pycnoscelus surinamensis*) as found several years ago by the Florida Station. Larval worms develop in the adipose tissue and in the body cavities of these cockroaches. Shortly after the infested roach is swallowed, the mature larvae are freed in the bird's crop from where they quickly migrate up the throat through the naso-lachrymal duct to the eyes. Excessive secretion of tears are symptoms of infestation. Besides general sanitary measures for controlling cockroaches, the birds may receive a drop or two of two per cent cresol solution in the eye socket for a few days daily.

In parts of the United States, gapeworms *Syngamus trachea* are of rather frequent occurrence. The paired individuals are usually found *en copula*. Heavy infestations are rare. In 1937, the Zoological Division (19), on examining 936 turkeys from the vicinity of Washington, D. C., found that 138 or 14.7 per cent of this number contained gapeworms. Over half of these had but two worms, the paired
male and female. All but two of the remaining turkeys had from four to 12 worms each. Of the two remaining, one had 14 worms, the other 46. In some cases, the gapeworms had caused lymphoid nodules in the lower part of the trachea. Clapham (20) reported similar but somewhat larger nodules in gapeworm infested pheasants in England. She also reported the presence of affected areas in gapeworm infested chickens.

Infestations may be either direct by the fowl swallowing the infective larvae from the eggs in the soil or indirect by eating earthworms that have swallowed the infective gapeworm larvae. For treatment, most authors recommend extraction of the worms by mechanical means. Some recommend 1/3 minim allyl sulphide in a 1:3 solution of linseed oil given per os thrice daily, about five doses in all. The remedy ruptures the worms which are then coughed up. Eggs from such worms are not viable.

Many species of fowl are subject to infestation with the long slender roundworm *Capillaria annulata* or *C. contorta*. The former requires an earthworm as an intermediate host while the latter may be transmitted without an intermediate host. The worms penetrate into the epithelial lining of the crop and cause thickening and sometimes congestion and inflammation.

As control measures, three parts tobacco dust (1.5 to 2.5 nicotine) to 100 parts of dry mash have been recommended.

Grasshoppers have become involved in the life cycle of *Cheliospirura hamulosa*, gizzard worm of chickens and turkeys. These small roundworms penetrate beneath the horny membrane lining the gizzard and bury themselves in the muscle. The lining is frequently loosened with a resulting nodular formation.

Another gizzard worm, *Amidostomum anseris* from ducks and geese has a direct life cycle, the birds becoming infected after eating embryonated eggs of the parasite. Sanitation to keep the worm eggs from grasshoppers and the administration of carbon tetrachloride in 1.5 to 2 cc. amounts for adult birds are recommended.

Two other small roundworms called stomach worms inhabit the region of the proventriculus. One of them, *Dispharynx spiralis*, has a sow bug as an intermediate host. Chickens infested with this worm exhibit severe injury from it. The other stomach worm, *Tetrameres americana*, may have cockroaches and grasshoppers as intermediate hosts. Fowls infested with these worms show a non-thrifty appearance and
general emaciation. Among the control measures recommended are the continuous feeding of tobacco dust at the rate of one per cent of the mash and the administration of carbon tetrachloride or tetrachlorethylene (5).

The cecal worm *Heterakis papillosa* continues to be the most prevalent intestinal parasite of chickens. Their resistant egg shells and protection in the tips of the ceca make it easy for infection to occur and difficult for the host to eliminate them. Aside from the nodules which they may cause in the lining of the blind gut and the role they may play in the transmission of the blackhead organism in turkeys, they have not been reported as causing serious damage to the fowl hosts.

Probably the greatest nematode damage to chickens arises when heavy infestations of the intestinal roundworm *Ascaridia lineata* occur in chicks a month or so of age. Carefully controlled experiments with several hundred parasitized and controlled chicks at the Kansas Station (21) showed that the body processes were considerably interrupted when the developing larvae punctured the intestinal epithelium by burying their anterior ends deeply between the villi causing loss of blood and lymph, lowered blood sugar, shrunken thymus glands, frequently increased urates, reduced growth rates and increased mortality.

During the same studies it was found that the chicken rapidly develops natural or age resistance to the growth and viability of these worms. If the chickens became two and a half to three months of age before becoming infested, the ingested worm eggs did not result in obvious injury to the host. The report at about the same time of results obtained at the Kansas Station (22) showing that the worm eggs lying at or near the surface in unshaded situations were killed by the summer temperatures, encouraged Kansas poultrymen to make serious efforts to keep their growing chicks free from ascaridia and other nematodes until they were two and a half to three months of age. Some used new ground, others rotation of lots, and still others raised young chickens upon wire screen. In applying these measures, the producers were controlling numerous other fowl parasites including coccidia.

In a study of possible relationship of vitamin A and B to parasitism, work at the Kansas Station (23), (24), showed that fowls on diet deficient in vitamin A or B (complex) were not able to develop the usual natural or age resistance and as a result the ascaridia thrived much better in the vitamin deficient chicks than in the controls to which the vitamins
were supplied. This work opened a new field of parasitological investigation, the subsequent findings of which have confirmed repeatedly the original Kansas discoveries. The principle holds whether it be in poultry, mammalian livestock, or man.

Tests with vitamin D showed that the nematodes were neither harmed nor helped by its presence, but the host chickens appeared to suffer less from the infestations when they were supplied with vitamin D.

Leaving the field of vitamins as factors in parasitism, the Kansas Station (25) made the tests of protein supplements in the form of milk and animal tissues as compared with plant ration supplements to a basal cereal ration. By taking chickens of the same age and giving all lots under comparison the same numbers of Ascaridia lineata eggs, the results showed that the chickens most resistant to the growth and viability of the nematodes were the group having supplements consisting of meat scrap meal, and skim milk ad libitum. Next in order of resistance manifested was the group receiving a supplement of meat scrap meal, while the group of chickens manifesting the least resistance were the ones on a peanut meal supplement to the cereal basal ration. A repetition of the experiment gave similar results. The greater resistance developed by the chickens on the milk-meat-cereal ration was attributed to a greater range of amino acids. The chickens on the peanut meal-cereal ration, besides having the lowest resistance to the parasites made the slowest gains. The most obvious explanation was the limited range of amino acids available in this all plant diet.

Studies are now in progress at the Kansas Station on other factors in age or natural resistance of chickens to this intestinal nematode. Tests were made recently on the nature of the food of the ascarid. Chickens of the same age were parasitized with the same numbers of ascaridia eggs. They were then separated into two lots, one to be nourished only by water and intramuscular injections of glucose, the other lot to be maintained on the regular ration by mouth. The results of repeated tests showed that the worms in the intestines of the injected chickens were unable to grow, whereas those in the normally fed chickens made the usual growth. It is thus obvious that the chicken nematode, Ascaridia lineata, normally feeds on the host ingesta (26), (27).

Further studies on suitable food for the ascaridia have led to culturing the young ascaridia in artificial media. By use
of dextrose cornmeal agar plates and salt-dextrose solutions, young worms were not only kept alive over a period of time, but were induced to grow. Some worms increased more than 50 per cent in length in the culture media, whereas the controls in the same basic solution failed to grow. This appears to be the first time that an ascarid or a heterakid larva from a warm blooded animal has grown in culture media. With this technique, it may be possible to throw more light on the nature of age or natural resistance of the host to its intestinal nematodes (28).

As the ascaridia of young, susceptible chickens inhabit the same portion of the small intestine as do the worms in the older and more resistant fowls, a histological study was made of the intestinal epithelium of chickens of different ages ranging in birds from two days to those of mature fowls. The histological study revealed the apparently new and interesting fact that the older and more resistant fowls have markedly larger numbers of goblet cells whose function is to furnish mucus for the lubrication of the inner gut surface. Being very few in the youngest birds, the goblet cells increase gradually in number with the age of the chicken up to three and a half or four months when they reach their maximum in number per area. It is an interesting coincidence that the chicken likewise reaches its maximum resistance at about three to four months of age. As these chickens succeed in eliminating their worms more readily at these ages, it is conceivable that the more copious supply of mucus in these birds makes it relatively more difficult for the intestinal worms to maintain their positions in their normal habitat against the peristaltic forces, so that it is possible that the goblet cells as producers of mucus may be factors in age or natural resistance of chickens to intestinal nematodes (29).

SUMMARY

1. A new malarial parasite, *Plasmodium lophurae* Coggeshall has been found to be pathogenic to young chickens.

2. Both chickens and turkeys may be attacked by species of the protozoan genus *Trichomonas* which may be fatal to the hosts.

3. Cecal coccidiosis, among the most important protozoan diseases of chickens, can be safely and effectively treated by repeated feedings of two per cent of sulphur in the ration. Under proper conditions, dried buttermilk in the ration as well as other remedies may be effective against coccidiosis.
4. New intermediate hosts of chicken tapeworms include many species of beetles *Coleoptera*, and a few species of ants. As many as 626 cysticercoids (larval tapeworms) may develop in the body cavity of one beetle.

5. Experimental evidence available for the first time showed that infestations of the fowl tapeworm, *Raillietina cesticillus*, may reduce the haemoglobin percentage and the blood sugar content of the fowl hosts. Evidence from these and other experiments show that growth may be retarded in tapeworm infested chickens. There are strong indications that tapeworms harbored for periods of from four to eight months may cause a form of paralysis in the host chickens.

6. Chickens two and one half to four months of age develop increased resistance against the growth of tapeworms but mature fowls in spite of their resistance may become infested with tapeworms.

7. Of 936 turkeys examined at Washington, D. C., 14.7 per cent were infested with gapeworms, some of which produced tracheal nodules. Similar nodules which may interfere with respiration have been reported from English pheasants infested with gapeworms.

8. Grasshoppers, cockroaches, and sow bugs may be intermediate hosts of small nematodes attacking the gizzard or proventriculus of chickens. Heavy infestations of the nematode *Ascaridia lineata* severely affect chickens one month old. A potent age resistance to this parasite develops in normal chickens three to four months old. Rations deficient in vitamin A or vitamin B (complex) lower the natural resistance to these nematodes.

9. Protein supplements in the form of skim milk and animal tissue added to a cereal basal ration produced markedly more resistant chickens to the ascaridia than did a protein supplement of peanut meal to the basal ration. The first ration supplied the wider range of amino acids.

10. Results of studies on factors in age resistance of chickens to roundworms show that (a) the nematodes normally feed on host ingesta; (b) young ascaridia will feed and grow in artificial media consisting of dextrose-corn meal, agar plates, and salt-dextrose solutions and (c) goblet cells of the small intestine may be a factor in age resistance as they increase in number with the age of the chicken up to three or four months when the fowl reaches its maximum resistance to the nematodes.
REFERENCES


CHAIRMAN AXBY: Certainly Dr. Ackert has followed out the
title of his paper, and I cannot help but think that we have come here
for the very purpose of getting the very latest information on such
subjects. If anyone has carried out his purpose on poultry parasites,
certainly Dr. Ackert has done so, and we are indeed very grateful.

Is Dr. Schwartz in the room? He seems to be absent. However, we
have his Report of the Committee on Parasitic Diseases, which has
been accepted and approved by the Executive Committee, so if there
are no objections we will accept and approve it without being read.

... Insert Report of the Committee on Parasitic Diseases.

REPORT OF THE COMMITTEE ON
PARASITIC DISEASES

DR. BENJAMIN SCHWARTZ, Chairman, Washington, D. C.

Dr. W. W. Dimock, Lexington, Ky.  Dr. T. W. M. Cameron, Montreal,
Dr. W. B. Craig, Indianapolis, Ind.  Canada
Dr. E. S. Brashier Jackson, Miss.

The report which follows is confined to two parasitic diseases, name-
ly, gastrointestinal parasitism in equines and trichomonad disease in
cattle. This is in conformity with the plan that the committee has
followed during the past few years by presenting at each meeting
information on and recommendations for dealing with specific prob-
lems in parasitology.

GASTROINTESTINAL PARASITISM IN EQUINES

Internal parasites of equines, confined largely to the gastrointestinal
tract, are widespread throughout the United States and other parts of
the world. Treatment of individual animals and more particularly of
entire herds at more or less regular intervals, has become a fairly
common practice in certain parts of this country. The practice of
mass treatment of horses and mules first came into prominence about
10 years ago in connection with organized campaigns for the control
of bots in equines. This was followed by an increased interest in the
control of sclerostomes or strongyles by the administration to horses
and other equines of oil of chenopodium or carbon tetrachloride, either
a few weeks before or a few weeks after treatment with carbon bi-
sulphid for the removal of bots. The striking and, at times, sensa-
tional improvement in the physical condition of debilitated equines
following the removal of strongyles by specific therapy, has tended to
overemphasize the value of medicinal treatment in controlling these
parasites, with the result that too little emphasis has been placed on
prophylaxis. Without attempting to minimize the value of chemo-
therapy in the control of parasites of equines, the committee desires
to emphasize the importance of sanitation and treatment of manure
as factors in the control of parasites in equine stock and to summarize
some of the important research advances in these directions made in
recent years.

The prevention of gross infestation with parasites that occur in
the gastrointestinal tract of horses, mules and other equines is large-
ly a matter of manure disposal. Investigations conducted in the
Bureau of Animal Industry over a period of years have shown defi-
nitely that the self-heating which horse manure undergoes is adequate
to destroy eggs and larvae of parasitic worms. In open manure piles,
only the surface layers escape the destructive influences of the heat generated, thus cutting down considerably the potential infective material present. When the manure is stored in tightly-fitting wooden containers having double walls and a tight fitting lid, it is rendered nearly helminthologically sterile in about two weeks, the few larvae that survive in the cold spots of the containers being almost negligible when compared to the thousands that perish. It is possible to shorten the process of egg and larva destruction in manure stored in containers by an arrangement which admits into the containers steam under pressure, this information having been elicited by experimentation conducted in the field station of the Zoological Division at Beltsville, Md.

During the past five years important investigations on the control of horse parasites through the chemical treatment of manure have been conducted in the Institute of Parasitology of McDonald College, Canada. So far only a few practical methods of treating manure heaps have been evolved and some data have been obtained on the types and states of chemicals which, in the presence of organic matter, are lethal to eggs or larvae or which damage larval sheaths. This knowledge is essential before satisfactory methods can be devised for controlling the free-living stages of the parasites.

Undoubtedly the most difficult situation in which to attack larvae is grass, and to date no satisfactory method of ridding pastures of eggs and larvae has been evolved. Chemical treatment of pastures is complicated by the fact that the grass must not be damaged and that the larvae are in positions from which chemicals rapidly drain. The presence of organic matter on grass adds a further complication to this type of treatment.

Where very valuable horses are kept on pastures, removal of feces, before the larvae can hatch and migrate from them is often justified. By this method it takes many months to clean a field, since one gram of fresh feces may eventually yield two or three thousand larvae. The method of collection must be very efficient to be effective, and from a practical standpoint absolute cleansing is out of the question.

In stables, the problem is practically unsolved. The use of the naked flame is seldom safe, while steam penetrates manure and cracks slowly. Accordingly, although larvae are very vulnerable to heat, heat treatment is seldom practicable. The use of many disinfectants cannot be recommended because of their comparatively low effect on strongyle larvae compared with their effect on other harmful organisms. To kill larvae, most disinfectants have to be used at quite impractical strengths, otherwise their use would give an entirely false sense of security. Of the simpler disinfectants which have been tested to date, oxyquinoline sulphate is the most lethal, but is too expensive; it is approximately twice as lethal as phenol, which can sterilize almost three hundred times its weight of fresh feces. At the present times cleanliness must be the standard method of parasite control in stables.

In manure heaps urine is a sterilizing agent which has the advantage of increasing the fertilizing value of the manure and which only costs the expense of collection. A horse passes sufficient urine to sterilize all of its feces so far as strongyles are concerned, but it is seldom that all the urine can be collected. However, in a manure pile only the outer few inches of the manure need be treated for reasons already given. On many farms cattle urine also is available for use in treating horse feces; however, cattle urine varies in its lethal
potency, although it is generally sufficiently lethal to make a satisfactory sterilizing agent.

When the drainage system is not sufficiently good to allow sufficient undiluted urine to be collected, artificial fertilizers are most likely to be the most practical chemicals to use, as part or all of their cost may be recovered in the increased value of the manure. Of the artificial fertilizers which are commonly marketed, urea is the most effective. When applied to fresh feces as an aqueous solution (one part of urea in 8 parts of water), it will sterilize approximately 150 times its weight of feces. Calurea is slightly more than half as effective. Powdered cyanamide, which is most effective in a considerably increased quantity of water, is only slightly inferior to calurea. A high grade kainit has the advantage on some lands and for some crops which need potash, of being more suitable to mix with manure. Furthermore, this substance tends to fix the ammonia in the manure, and will sterilize about twenty-six times its weight of fresh feces. Sodium nitrate has a value equivalent to that of kainit. There are many other available fertilizers, such as potassium nitrate, ammonium nitrate, calnitro, diammonium phosphate, nitro chalk, potassium chloride and calcium nitrate, which can sterilize slightly over twenty times their weight of fresh feces when applied as medium strengthened solutions; slightly less potent are ammonium sulphate, muriate of potash and carbonate of potash.

Undried poultry manure will sterilize approximately three times its weight of horse feces; on a few farms it may make a practical sterilizing agent, if carefully mixed in the outer few inches of a manure pile.

Fluids are most easily applied to manure, if the latter is in a concrete manure pit; however, even in heaps, provided the manure is well packed and the fluid carefully distributed, it should remain in contact with the manure sufficiently long to sterilize its as regards the free-living stages of bursate nematodes. Effective sterilization is more likely to be obtained with a fluid than with a dry chemical. Fluids carefully applied will penetrate into the center of lumps of feces but most dry chemicals will not. Moreover, when manure dries there is probably a tendency for the infective larvae to withdraw into the moist lumps of feces and so avoid the chemical if it is applied dry.

In addition to the procedures outlined, much can be accomplished by a system of stock rotation on farms where various classes of livestock are available. Since the parasites of equines represent a highly specialized and a highly host specific group of worms, it is safe to rotate stock so that ruminants or swine will follow equines and vice versa.

The use of all known prophylactic procedures along with medicinal treatment will materially reduce parasitic infestation in equines as it will in other farm animals. Chemotherapy alone falls far too short of bringing about a radical diminution in the parasite population of domestic animals.

TRICHOMONAD DISEASE OF CATTLE

A year ago this committee called attention to the occurrence of bovine genital trichomoniasis in the United States and emphasized the economic importance of this disease to the dairy and beef cattle industry of this country. Since the submission of that report the Bureau of Animal Industry has been conducting a survey to determine
the prevalence of bovine trichomoniasis in the United States, and the information already available has shown that this disease is definitely known to be present in 27 States as follows: California, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Nebraska, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Utah, West Virginia, Wisconsin and Wyoming; the disease is also known to occur in Puerto Rico and probably in Hawaii. The extent to which trichomoniasis is present in the states named is unknown. Information obtained by members of the staff of the Zoological Division of the Bureau of Animal Industry by correspondence and by attendance at meetings of state veterinary associations, indicates that trichomoniasis is quite prevalent in certain dairy sections but accurate information on this point is rather difficult to obtain.

One of the chief difficulties encountered in attempts to obtain accurate information on the prevalence of trichomonad disease in cattle is the absence of a reliable diagnostic procedure. A presumptive diagnosis of trichomoniasis can be made on the basis of the herd history; the presumptive diagnosis must be confirmed, however, by the discovery of the causative organism in the vagina, and this may involve repeated microscopic examinations of vaginal discharges. Attempts to develop a reliable diagnostic test other than the microscopic test now available, have yielded negative results. Most of the information concerning the prevalence of trichomoniasis in the United States has been elicited from Bureau of Animal Industry inspectors engaged in Bang's disease eradication. In general, experiment station workers are too busy with other problems in animal disease and can furnish only sketchy information in response to questionnaires. Information cannot, in most instances, be elicited from herd owners and managers because of a reluctance on their part to discuss a disease which may affect the sale value of their animals.

In order to secure precise information on the prevalence and distribution of trichomonad disease in cattle, it appears necessary to secure the wholehearted co-operation of livestock sanitary officials, State experiment station workers and veterinarians engaged in private practice. The Zoological Division would be glad to receive information in order to map the distribution of this disease and to determine its economic importance in the United States.

Since trichomoniasis is transmitted to cows and heifers by coitus, it is important to avoid introducing into a heard bulls whose past performance indicates that they may be infected with trichomonads. As illustrations of the danger of introducing this infection into clean herds, the following case histories investigated by the Zoological Division are cited:

Outbreaks of trichomoniasis were traced in 3 herds, designated as A, B and C respectively. The disease had apparently existed in herd A for a long time, but its origin could not be traced. A bull from herd A was introduced into herd B, and some time thereafter it was noticed that the cows in the latter herd showed breeding difficulties. One sample from a cow suspected of harboring the organisms was examined and found to be positive for trichomonads. Some time after the removal of the infected bull from herd B, an inquiry was received from the owner of herd C relative to breeding difficulties among his cows, which were found to be infected with trichomonads by laboratory examination. Upon further inquiry it was determined that the bull from herd B had been sold to the owners of herd C, and the breeding difficulties in the latter herd were traced definitely to the newly acquired infected bull.
In another case trichomonads were found in a vaginal smear submitted for microscopic examination. In attempting to trace the source of the infection, the following information was elicited from the owner: A cow from his herd was sent to a nationally prominent dairy show. There she was bred to a bull that was also on exhibition. As the cow failed to conceive following this service, she was later rebred to the herd sire. The herd sire apparently acquired the infection from the cow, which in turn acquired it apparently from being served by the bull at the dairy show. The herd bull having thus become infected, transmitted trichomoniasis to sixteen cows of the herd which he served. This herd history illustrates conclusively that a single service by a bull whose breeding record is unknown may be the starting point of an infection that may subsequently involve an entire herd.

In view of the cases cited it is quite clear that the utmost caution should be exercised in buying mature animals as permanent additions to the herd. The breeding histories of all such animals, whether male or female, and the breeding histories of the herd from which they come should be carefully investigated. Bulls with poor breeding records, no matter what their blood lines may be, should not be admitted indiscriminately to a herd free from trichomonad infection. It may be that the value of the blood lines is such that it overshadows the probable losses involved in the introduction of a breeding disease not already present in a herd. This would be a matter for the owner to judge, but he should buy with a full knowledge of all the facts.

Permitting cows known as hard and difficult breeders to be brought on the premises for breeding purposes may be fraught with danger. It should be determined, if possible, the reason why the animals are hard breeders and information should be secured on the breeding conditions prevailing in the herd from which the animals come.

Permitting cows to be bred away from their own premises may be equally dangerous. These animals may acquire trichomoniasis through the service of a bull and later serve as a source of infection to other animals in the herd to which they return.

As a rule, trichomoniasis is well established and a number of animals are infected before the owner or manager becomes aware of its presence. Since the disease is spread by coitus and chronically infected bulls have been considered incurable, it has been advocated that such infected bulls should be eliminated from the herd and that new uninfected bulls should be purchased. This advice is theoretically sound, but it is not always practical, and experience indicates that other procedures are available. A practice followed in certain infected herds seems to be more practical and consists in restricting the use of infected bulls to cows that have either passed through an attack of the disease or which have been previously exposed to the disease. In large herds where a number of bulls are used and where there is reason to believe that all of them are infected, the services of each bull can be restricted to certain groups of cows. New, clean bulls should be provided for cows that are definitely known not to be infected and to heifers of breeding age.

There are some cases of trichomoniasis reported in virgin heifers. These cases were found in heifers which had been in close contact with infected cows. The presence of trichomonad infection in such heifers is explained on the theory that infection was acquired by contact. There is at the present time no experimental evidence that such contact infection can occur, but in order to be on the safe side, it is
suggested that in infected herds, the calves and heifers be definitely separated from known infected animals.

In cases of early, complete and uncomplicated abortion due to trichomoniasis, the cow should be isolated and given a sexual rest for a period of about 3 months. The first estrual period usually occurs a few days after the abortion; permit this heat period and at least the next 2 heat periods to pass without breeding.

In cases of temporary sterility due to trichomoniasis, the estrual periods may be quite irregular. Breeding should be stopped until estrus has been regular for about 3 periods.

A summary of the precautions that can and should be taken by owners to prevent the introduction of trichomoniasis into their herds and to minimize the effects of the disease after it has been introduced follows:

1. Avoid buying any mature animals as a permanent addition to a herd without making a thorough investigation of the breeding record of the animals about to be purchased and of the herd in which it originates.

2. Avoid the introduction of animals for breeding purposes without knowing their breeding history and the breeding history of the herd from which these animals come.

3. Avoid breeding cows outside the herd without determining the breeding record of the bull.

4. If it is determined that breeding troubles are due to trichomoniasis, stop breeding operations for a time and determine from available records which animals are infected and which may reasonably be suspected of being infected. Restrict the breeding of known infected bulls and of bulls suspected of being infected to cows that have passed through an attack of the disease and to cows that have been previously exposed.

5. Provide an uninfected bull for heifers coming to breeding age and for cows that have not been exposed to the disease.

6. In cases of early abortion due to trichomoniasis, provided the abortion is clean and uncomplicated, give the cows sexual rest for about three months. If the abortion is incomplete and there are complications, such as a persistent vaginal discharge, and in cases of pyometra, the advice of a veterinarian must be sought. In cases of temporary sterility due to trichomoniasis, breeding should be stopped until the estrual periods have definitely returned to normal.

BENJAMIN SCHWARTZ, Chairman.

Due to the fact that last evening the Executive Committee agreed to meet immediately after adjournment at this hour, and as there are two more reports under this section of the Committee on Parasitic Diseases, if there are no objections I would ask that we adjourn at this time, and continue this immediately after re-convening. That will then give the Executive Committee an opportunity to meet.

We stand adjourned until one fifteen.

. . . The meeting adjourned at 12:20 o'clock . . .
FRIDAY AFTERNOON, DECEMBER 2, 1938
The meeting convened at 1:30 o'clock, President D. E. Westmorland
presiding.

PRESIDENT WESTMORLAND: The meeting will come to order. The
first paper this afternoon will be, "Tuberculosis in Poultry and
Swine," by Dr. J. A. Barger, Bureau of Animal Industry, Washington,
D. C.  (Applause.)

. . . Dr. Barger read his prepared paper.

TUBERCULOSIS IN POULTRY AND SWINE

By J. A. BARGER, D. V. M., Des Moines, Iowa

Poultry is raised on 206,657 Iowa farms. This industry has
an aggregate value of approximately 70 millions dollars. On
many of these farms the sanitary conditions and flock man-
agement are quite satisfactory and it is under such environ-
ment that the top grades of poultry are produced.

This condition is in marked contrast to the farm on the
"back-forty," so to speak, where neglect, insanitation, and
disease have made the poultry flock unprofitable. Not only
that, but, when the birds from these farms find their way
into the kitchen of the consumer, they are repellent to the
purchase of any more poultry; at least, until the vision of
tuberculosis nodules and other disease manifestations have
faded away. It is not infrequent that veterinarians answer
the telephone call of some inquiring housewife as to the
significance of such unsightly conditions that she has found
in a fowl she is preparing for food.

This situation represents the common problem of both
those interested in poultry as a business enterprise (either
producer, processor, or hatcheryman) and those interested
more particularly in disease control work as sanitarians. The
production of a higher per cent of top grade poultry should
not be anticipated, nor can the antipathy of the consumer
be dispelled, until the tuberculous poultry flock is eliminated
from the picture.

The necessity for this is further apparent when it is real-
ized that, on an average, one out of every six hogs slaugh-
tered in the northwestern part of the Corn Belt is retained,
on inspection, because of tuberculosis.

Aside from the direct damage done by the tuberculous fowl
in spreading the infection of the disease to other members
of the flock and to the swine with which it may come in con-
tact, serious consideration should be given to the extent of
the damage that may result from it in sensitizing cattle to
mammalian tuberculin. Sensitivity of cattle due to the avian
tubercle bacillus may become a confusing element in the comple-
tion of the eradication of bovine tuberculosis according to
Feldman* and Plum* who have done research work along
this line.

In an effort to bring about the suppression of tuberculosis
and other diseases and conditions which hamper the poultry
industry in Iowa, the same as in other states, an organization
with wide ramifications and influence has been formed. This
organization is known as the Iowa Poultry Disease Control
and Sanitation Committee. All phases of the poultry indus-
try, as well as the Iowa State Swine Growers Association,
the State and Federal regulatory forces, the State Extension
Service and county agents, the various livestock exchanges,
and the Institute of American Poultry Industries are repre-
sented on this committee.

This organization is developing local community interest
in the suppression of poultry diseases. County poultry com-
mittees have been and are being formed. These committees
are sponsoring poultry clinics. Farmers bring their diseased
poultry to these clinics and learn the cause of the unthrifti-
ness and frequent death of the birds and to what extent
sanitary measures and flock management should be expected
to correct the condition. These clinics, the value of which
cannot be overestimated, are only a part of the educational
program for the improvement of poultry.

The other important part of the program is the holding
of series of meetings in localities where the local people
have shown sufficient interest to issue invitations and arrange
for the necessary publicity. Speakers are furnished for these
meetings who are qualified to talk on disease and parasites
which effect poultry, the susceptibility of swine to poultry
tuberculosis, sanitation and flock management in the control
of disease, poultry marketing, poultry husbandry, and other
kindred subjects. Progress in this undertaking can be ex-
pected when the producers are acquainted with the causes
and manner of the spread of disease and have practical plans
for control suggested to them.

While these clinics and meetings are held primarily for the
producer, yet, hatcherymen, produce buyers, resident veteri-
narians, men and women from civic clubs, school teachers,
and others attend and in turn disseminate information con-
cerning the control of disease. Farmers are urged to use the
local veterinarians for obtaining correct diagnosis of their

*"Avian Tubercular Infections" by H. W. Feldman, D. V. M., M. S (Williams
and Wilkins Company, Baltimore, Maryland, 1938).
poultry trouble and to learn the proper method of prevention and treatment of disease.

From surveys made by use of the tuberculin test, it has been definitely established that as many as 60 per cent of the poultry flocks in some sections of the Corn Belt have tuberculous birds in them.

These diseased birds are ever a source of danger to the rest of the poultry and to the swine on the premises and will remain so until the owners, for one reason or another, are ready and willing to dispose of them and raise a healthy flock. Therefore, every effort of an educational nature, which is calculated to show the damage that is being done by the tuberculous fowl, must be directed toward the owner.

This introduces the question as to how best to activate or approach the owner of the diseased flock. Will it suffice to apprise him of the existence of tuberculosis in his poultry, or will stern methods, such as the enactment of compulsory eradication laws, finally be required?

These are questions which are being pondered in the minds of many interested persons today.

In this connection it is interesting to note that in one county where an attempt was made to inspect the poultry of every flock owner, approximately 60 per cent welcomed the inspection, 20 per cent were induced to submit to inspection, while the remaining 20 per cent were indifferent, reluctant, an antagonistic. In reviewing the activity in this county about a year later, new movable poultry houses on clean ground were much in evidence and a goodly number of the conditions of other flocks were markedly improved, but among the approximately 40 per cent which did not welcome the inspection, little or no improvement had taken place.

To a great extent the manifest indifference of some poultrymen to the presence of tuberculosis in their flocks is accounted for by the lack of discrimination on the part of many produce buyers. Some processors of poultry market the top grade of birds under their own label, while the lower grades are sold without any such identification.

It is common knowledge that insanitation and disease are more than any other factors the causes of low-grade poultry, and so long as there is an outlet for this type of birds without any material discrimination, just so long will the progress of the eradication of disease be delayed; and in the meantime the stigma of disease and meat food substitutes will plague the poultry industry, and swine in large numbers will continue to be retained for tuberculosis.
Over a considerable period of years, veterinarians in the bovine tuberculosis work, agricultural workers, and others have spent long hours, in addition to their regular tasks, urging the suppression of tuberculosis of poultry. The farm press has been liberal in giving space for the same cause and it would be difficult to evaluate the good that has been done in this way; but, unfortunately, tuberculosis in many instances is found year after year in the same flock.

We feel that the integration of the many groups into one statewide committee, with well defined plans approved by the regulatory officials, will be measurably successful in stimulating community interest and in activating the producer into purging his flock of disease; and that the county committees, which have been and are being formed under the guidance of this committee, will keep this interest alive and that as a result of these manifold interests and efforts, there should be a downward trend in swine and avian tuberculosis as well as many other poultry diseases.

The beneficial influence of those fostering and those more remotely concerned in the National Poultry Improvement Plan should also be an important factor in controlling diseases far beyond that of pullorum, which is one of its special projects in which great progress is being made.

Likewise, the American Institute of Poultry Industries, which is correlating its work with the Iowa committee, is deserving of considerable credit for its presentation of the volume of losses incident to swine and poultry tuberculosis. It is the purpose of the Institute to continue to bring these losses to the attention of the producer through the agencies of produce buyers and others. The remedial measures which the Institute has suggested are in harmony with the accepted plans for the reduction of disease.

If, coupled with these efforts, the buyers of poultry, after a certain specified time, would discriminate in favor of top grades and discourage the attempts to market unthrifty or lower grades of poultry, the task of getting rid of disease would be materially simplified. In the meantime the educational program must be continued relentlessly for it will require the employment of proper sanitary measures and flock management over a period of several years to raise a healthy flock on what is now an infected farm.

Only by a clear understanding of the gigantic task ahead, the objectives sought, and the availability of the agencies through which the task may be accomplished, can we hope
DISCUSSION, AVIAN TUBERCULOSIS

for success in the control of avian and swine tuberculosis and other diseases which hamper the poultry industry.

PRESIDENT WESTMORLAND: The discussion on this paper will be given by Mr. John M. Stout, Superintendent, Division of Animal Industry, Springfield, Illinois. (Applause.)

MR. JOHN M. STOUT (Illinois): The State of Illinois wishes to thank you, Mr. President, and this organization for having placed one of its citizens on your program.

. . . Mr. Stout read his discussion.

DISCUSSION OF DOCTOR BARGER’S PAPER
“TUBERCULOSIS IN POULTRY AND SWINE”

By Mr. John P. Stout, Springfield, Ill.
Division of Animal Industry

MR. CHAIRMAN: Doctor Barger has so very clearly and concisely presented his paper on tuberculosis in poultry and swine that there is scarcely any need for further discussion and since time marches on my discussion will be brief.

The poultry industry is a tremendous industry, it ranks fifth in gross income, yet, the value per unit is not great. If an owner looses one fowl or even half a dozen his loss in dollars is not great. This I believe accounts largely for the fact that the average farm owner does not take better care of his flocks and does not spend much for equipment.

We did quite a lot of poultry testing mostly in the northern half of the state in 1929, 1930 and 1931. Following the work at that time the percentage of hog retentions at the Chicago Stock Yard did decrease. We hope the testing and elimination of reacting birds had something to do with the decrease. There was a lapse of a few years in which no definite avian tuberculosis control work was carried on. Then in 1936 some testing was done in each of five different counties. In the early summer of 1937 and during the winter of 1937-1938 one-half of one county was tested and one township in a second. This winter we hope to test one township in five counties.

The testing is entirely voluntary and we encourage it because it offers something tangible and concrete, and whether the flock is tested or not our veterinarians have an opportunity to see the flock and talk to the owners concerning the course of the disease, also the disposing of all old birds and
sanitation. In one township we made a special effort to test as many flocks as possible. I believe about 85 per cent of the flocks were tested. I do not believe we really accomplished any better results in that township than in some others where only 50 per cent of the flocks were tested. In one township we tested only 24 per cent of the flocks, but each farm had been visited. The testing in all of these counties has verified the findings of others, that the larger percentage of reactors is found in old birds. The flock infection was as high as 67 per cent in some areas.

Now after the scattered work done in our state during the past three years the report of hogs slaughtered at Chicago again showed a decrease in the percentage of carcasses retained. Again we hoped that our work coupled with that of other states in the Chicago area, had been responsible. At least it does encourage us to follow on with our plan of educational work in as many counties as we can during the winter months. Our plan consists of holding a clinic in the county just before leaving it, holding autopsies on the farms as the testing is carried on and urging that only young birds be retained in the flock. If at all possible, the breeding hogs are tested, using both avian and mammalian tuberculin. These tests have shown very few hogs reacting to mammalian tuberculin and less than 10 per cent to the avian.

The packers claim their losses are over two million dollars annually because of hog carcasses retained on account of avian tuberculosis. We have every reason to believe this loss is passed on to the hog producer. We, as sanitary officials, should encourage educational work with a view of controlling this malady in live stock.

If any progress is to be developed in educational work or any other mode of attack it must have the support of the industry involved. I agree with those that believe that startling results will not be obtained until the flock owners feel the loss in dollars and cents, because the processors of poultry refuse to purchase low grade birds.

Sometimes achievements are accomplished without a lot of publicity and fanfare. I believe we can do much good in avian tuberculosis control without any resentment or ill feeling among producers.

PRESIDENT WESTMORLAND: Thank you, Mr. Stout, for your contribution to this program.
The next gentleman on the program is one whom we all know and love. He needs no introduction. Dr. A. E. Wight, Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, Washington, D. C., whose paper is titled, “The Progress and Status of Co-operative Tuberculosis Eradication Work.” (Applause.)

... Dr. Wight read his prepared paper.

THE PROGRESS AND STATUS OF CO-OPERATIVE TUBERCULOSIS ERADICATION WORK

By Dr. A. E. Wight, Washington, D. C.

Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, United States Department of Agriculture

Good progress has been made in the tuberculosis eradication project, which is being conducted co-operatively by the federal government and all the states and territories, since our last meeting. It has been possible to continue a sufficient amount of tuberculin testing of cattle in the modified tuberculosis-free areas so that their status as practically tuberculosis-free areas could be maintained.

One state, namely South Dakota, was added to the list of those in which all the counties are in the modified tuberculosis-free area. Such action took place on July 1, 1938. The livestock owners and others interested in the livestock industry in that state are to be highly complimented for the splendid co-operation they furnished the state and federal officials connected with the work in the recent years of the program in South Dakota. The opposition to the work, which had been quite a serious problem, disappeared when it was possible to proceed with the tuberculin testing of cattle under the area plan with additional funds furnished by the federal government.

During the fiscal year ended June 30, 1938, tuberculin tests were applied to approximately 14,100,000 cattle, and the percentage of reactors was 0.6, which was the lowest degree of infection found in any year throughout the project, which began in 1917. When the percentage of reactors found is confined to localities where the work consisted of retesting only, it is found to be slightly less than 0.3.

STATE AND FEDERAL FUNDS

The combined state, territorial, and county appropriations used in connection with tuberculosis eradication work during the last fiscal year amounted to about $4,000,000, which was used for indemnity and operating expenses. Federal funds,
including those furnished by emergency appropriations for the work, amounted to approximately $3,200,000. These funds were also for compensating the owners for reactors and for operating expenses.

ACCREDITED HERD WORK

According to the records of the Bureau of Animal Industry, there were on October 1, 1938, 267,415 accredited herds, containing about 3,790,000 cattle. The number of accredited herds is about the same as has been reported during the last two or three years. The accredited herd feature of tuberculosis eradication work continues to be of much importance in several states and especially in herds of registered pure-bred cattle. In some of the states the authorities in charge of the work do not give very much attention to the accredited herd feature because of the fact that work is conducted under the area plan. In a few states the accredited herds of cattle were retested by local practicing accredited veterinarians at state expense. It will be noted from the summary of tuberculosis eradication work that the largest number of accredited herds continues to be in the state of New York.

AREA WORK

During the year ended November 1, 1938, 31 counties have been added to the list of those in the modified tuberculosis free area, indicating that bovine tuberculosis in such localities exists to less than one-half of one per cent. In addition to these, 27 municipalities in Puerto Rico were placed in that status. The tuberculin testing of all the cattle in the Virgin Islands has been completed, and the other municipality will be accredited on December 1.

Much progress has been made in connection with the eradication of bovine tuberculosis in the state of California during the past year, but as this subject is to be fully covered by another speaker on this program, it will not be necessary to comment upon it here to much extent. The state and federal officials in charge of the work in California are to be complimented on the results that have been obtained in reducing the amount of bovine tuberculosis in that state.

It is expected that all the remaining non-modified municipalities in Puerto Rico will be placed in the modified accredited area during the next few months.

CATTLE TUBERCULIN TESTED FOR INTERSTATE SHIPMENT

The greater part of the tuberculin testing of dairy and breeding cattle for interstate shipment is done by private
practicing veterinarians, who during the past fiscal year applied such tests to approximately 176,000 cattle, among which were found only 95 reactors, or 0.05 of one per cent. These tests were made in order to comply with state requirements in connection with the interstate movement of cattle. It may be stated at this time that the requirement in paragraph 2 of section 2, regulation 7 of Amendment 2 to B. A. I. Order 309 was revoked June 1, 1938. Therefore, it is no longer necessary for the owners or shippers of semirange and range cattle to make a written declaration that such cattle originated in a modified accredited area when making interstate shipments.

AVIAN TUBERCULOSIS

The avian tuberculosis problem continues to be a serious one, in that both swine and poultry are affected by this type of the disease. The presence of tuberculosis of the avian type in any locality is also a feature that must be given proper consideration and attention in connection with the tuberculin testing of cattle under any plan. The control and eradication of avian tuberculosis have been conducted to some extent in practically all the Central and North Central States during the past year. It has been possible to interest a large number of flock owners in this project, as well as many agencies interested in the poultry and swine industries.

During the past fiscal year approximately 9,000 flocks, located in 10 states, were observed by the veterinarians who were assigned to this project, and as a result of these inspections, the presence of infection was determined on approximately 1,600 farms. The veterinarians who are engaged in the tuberculin testing of cattle continue to observe poultry flocks in states where it is deemed advisable to do so, and during the past fiscal year they observed approximately 128,000 flocks, and infection was reported on about 6,000 farms.

The regulations in some of the states make provisions to prevent the introduction of tuberculosis through the entrance of fowls that may carry the disease. This appears to be a sound practice to follow, especially in the states where a very limited amount of the disease is known to exist.

The subject of avian tuberculosis is to be taken up on this program today; therefore, it will not be necessary to enlarge upon it here at this time.

POST-MORTEM RESULTS SHOW A DECREASE IN THE AMOUNT OF TUBERCULOSIS FOUND AMONG CATTLE AND SWINE

From the records of the Meat Inspection Division of the
United States Bureau of Animal Industry, it is observed that the percentage of cattle showing any evidence of tuberculosis upon post-mortem examination and which had not been classified as reactors to the tuberculin test is slightly less than the previous year. Out of approximately 10 million cattle slaughtered under Federal supervision during the fiscal year ended June 30, 1938, only 11,668, or 0.1 of one percent, showed any evidence of this disease. Of the 11,668 cattle, only about 2,800 were condemned as unfit for food or passed for cooking purposes. This is about 0.03 of one percent of the total cattle slaughtered under federal supervision.

During the fiscal year ended June 30, 1938, approximately 32,450,000 hogs were given post-mortem examinations by the veterinarians of the Bureau of Animal Industry engaged in meat inspection work. Out of this number about 2,900,000, or 9.1 percent, showed some evidence of tuberculosis. This is a slight decrease in comparison with results of the previous year. Of the total number of hogs retained for tuberculosis, only 12,423 (0.4 percent) were condemned as unfit for food on account of tuberculosis, and 13,665 (0.4 percent) were passed for cooking purposes. This is approximately the same percentage that was reported the previous year. All the remaining hogs that were retained for further inspection were passed for food purposes after the slight lesions found in them were removed under Bureau supervision.

The reports received from the various meat inspection stations of the Bureau of Animal Industry covering tuberculosis found in cattle and swine on the regular kill have continued to be of much value in locating centers of infection. During the past fiscal year it was possible to trace many shipments of cattle and swine that were found to show some evidence of tuberculosis upon post-mortem examination. This feature of the work will continue to be of value each year, and more attention will be given to it. A very interesting case in this connection has come to the attention of the Bureau, a brief description of which is as follows:

At one of the large markets in the Central West, out of a mixed shipment a few tuberculous cattle were found upon post-mortem examination. It was possible for the bureau employees who examined the cattle to give information to the field men in sufficient detail so that the origin of the cattle was located. The original owner, whose farm was a considerable distance from the point where the tuberculous cattle were found, was interviewed by a bureau veterinarian, who later applied tuberculin tests to the cattle remaining on
the premises, with the result that quite a high percentage of
the cattle reacted to the test. The owner was very much
surprised to know that infection existed on his premises, and
was very anxious to have it eradicated as early as possible.
He accompanied the reacting cattle to the packing center
where they were killed under federal inspection and observed
the lesions of tuberculosis, some of which were quite exten-
sive. He expressed himself as being very much pleased that
it was possible for bureau veterinarians to locate the infec-
tion in his herd before more serious damage resulted, and it
is his intention to do everything possible to have the disease
eradicated in his herd. This illustrates very clearly the value
of the reports from the meat inspection service in this con-
nection, because in many of the counties in the Middle West-
ern States all the cattle are not retested when the tuberculin
test is conducted in order to remodify a county.

JOHNE'S DISEASE (PARATUBERCULOSIS)

This disease was found to exist to some degree in 10 states
during the past year as a result of tests made of about 4,000
cattle with either johnin or avian tuberculin. The percentage
of reactors was 7.2. Much more research will have to be con-
ducted in connection with the study of this disease, and it
is hoped that the work to be done at the new Federal Animal
Disease Laboratory at Auburn, Alabama, will be helpful in
this connection. In some localities in various parts of the
United States, Johne's disease appears to be quite a serious
problem. The owners of herds affected with this disease
appreciate its seriousness and have been found to be very
anxious to assist in its control and eradication as much as
possible.

PERSONNEL

The state and territorial authorities employed an average
of 300 veterinarians throughout the year, and 237 veterinar-
ians were employed by counties on full time. The federal
government employed about 230 emergency veterinarians, in-
cluding those working on a part-time basis at a per diem rate.
In some localities, local helpers were employed to assist the
veterinarians in the field. The regularly employed veterinar-
ians of the Bureau have taken part in the work but much of
their time is devoted to supervisory duties.

APPRaisal VALUE AND INDEMNITY

The owners of tuberculous cattle removed for slaughter as
a result of the tuberculin test received an average salvage of
about $32.00 during the last fiscal year, which is about $3.00 more than the average salvage for the previous fiscal year. The average appraisal was about $86.00, which is about the same as it was for the previous year. The combined State and Federal payments received by owners of these cattle amounted to an average of approximately $35.00. Of the cattle that were slaughtered, 4 per cent were registered pure-bred animals.

The maximum Federal payment continued to be $25.00 for grade cattle and $50.00 for registered purebred cattle, but under the provisions of the law beginning July 1, 1938, the Federal payment is limited to one-third of the difference between the appraised value and the salvage and it is not to exceed the amount paid or to be paid by the cooperating agency.

CONCLUSION

From what has been stated in this report, it is apparent that a considerable amount of work is necessary to control and eradicate bovine tuberculosis even though nearly all the counties in the United States are in what is known as the modified tuberculosis-free area. The volume of work is, of course, greatly reduced from what it was during the time when the disease was much more prevalent. Adequate follow-up measures are essential, and, as previously stated on many occasions by the speaker, the tuberculin testing of cattle at proper intervals in the modified area and the prompt removal of reactors are essential.

This report has necessarily contained some statistical material, but in order that you may have a more complete report in this connection, a special statistical pamphlet has been prepared and is available at this meeting. If additional copies are desired by anyone, they will be furnished upon request.

In closing permit me to express much appreciation of the service rendered by the livestock owners, the public press, the radio, the livestock commissioners, and many others, who have done so much to assist in this work that has been conducted during the last 12 months to control and eradicate tuberculosis in our domestic animals.

PRESIDENT WESTMORLAND: Thank you, Dr. Wight. This splendid and comprehensive report on co-operative tuberculosis eradication work is appreciated.
TUBERCULOSIS ERADICATION IN THE STATE OF CALIFORNIA

By Dr. C. U. Duckworth, Sacramento, Calif.
Chief, Division of Animal Industry

Mr. Chairman, I would not have the timidity to stand here and try to tell you how to eradicate tuberculosis in your cattle. I am afraid I might be like Mark Twain. He said that when he was fourteen years old he thought his father was about the dumbest man in the world. By the time he was twenty-one he was surprised how much the old man had learned. (Laughter.)

Rather than try to tell you how, I am going to tell you why California is in the position it is in, and assure you that we are endeavoring to the best of our ability to correct the condition and to minimize the possibility of you people contracting infection in your herds from the focus of infection still existing in California.

Yesterday we heard Dr. Cotton speak about the importance of the long-time aspect. We were not interested primarily in what would happen tomorrow or next week, but many years from now. Unfortunately, that thought was not recognized in California a few years ago, and some of the other parts of the country, in beginning their tuberculin testing program, shipped us a lot of tuberculosis by way of reactor animals. It was introduced into several parts of the state. Later, in 1915 to be specific, the legislature enacted a law providing that milk or dairy products, to be consumed raw, had to be from cows negative to tuberculin. But they made no provision for the disposition of the reactor, but did provide that the animal should be tattooed on the left ear with the letter "T."

That was all before my time. I was working up there in Montana for a while, and I was pretty well accustomed to seeing cows with two ears. When I got down to California I thought I had run into a new breed of cow, that did not have any left ears at all. Tattoos would be put into a cow's ear, and they would be cut out, and the cow sold to somebody else, and as a result tuberculosis was spread practically all over the State of California. In my opinion that legislation —while it was enacted as a public health measure—was the
greatest factor in the dissemination of tuberculosis throughout the state.

Then, in 1921, we enacted what was called the Free Area Law. Under that law work was conducted by the state and federal government, but no indemnity was paid because at that time it was held illegal.

In 1931, the state and government began on a cooperative program of eradication similar to that conducted in other states in the Union. Sometimes, we know, it is necessary to make excuses for ourselves out there. We have been working now on a cooperative basis with the government for seven years, but it took a great many years more than seven, in many of the states, to do their job, so perhaps if we look at the length of time it took, when the two organizations got together, maybe California is not so bad off after all.

Since I got back here, one of my old friends told me of a friend of his who went out to California. The two men started out a hotel door. The one fellow looked up, stuck out his hand and asked, "What the dickens! is it raining?" "No, brother," the other replied, "that's orange juice." (Laughter.)

And so we have to figure up some excuses to live up to our reputation out there. The best one I can think of off hand is that we just could not start fast enough, but by the time we have had the cooperation of the government as long as some of the rest of you, I imagine we will have the job done.

Now, we have found good support in doing this work. The industry recognized the necessity of it. There had been sufficient publicity, and the people were acquainted with the work as it was being done throughout the United States to give us, for the most part, co-operation. Then, when the drought came along, California (being dry in some parts) was a bit drier, and the people were glad to have the cattle move because they were hauling feed and water to them, and if they could get rid of them and get a little money in their pocket it was better than feeding and watering them for an indefinite period of time. That helped.

However, we soon found an organized opposition springing up, and there was a rather unfortunate set of circumstances in that the work in those areas was being conducted under a county ordinance, worded, however, almost identically with the state law. The state had no funds to spend in those areas, so that the government was doing it alone under county ordinances. The ordinances were challenged
in our superior court, and the superior court upheld their validity. It was then immediately appealed to the appellate court, which is the next higher court, and the lower court was sustained in its judgment. From there the appeal went again to the Supreme Court of the State California, and that body sustained the appellate court.

Following that, the opposition instituted another action entirely, claiming that the law violated the Fourteenth Amendment to the Constitution of the United States, in that it did not provide a hearing, that it confiscated a man's property without giving him the right of hearing.

So we went into the federal court then, with the same ordinances that had been ruled to be valid by the highest court in the State of California. The federal court upheld the validity of the ordinance, and it was appealed to the next higher federal court. That sustained the judgment of the lower federal court, and it was appealed to the United States Supreme Court, and that body denied a hearing.

Another county whose ordinance was almost identical had to go through the same procedure. Finally we got to a point where the state enacted a law that superceded the county ordinances, so immediately here was a brand new law to attack, and it has been under attack ever since.

It got to the point where men would not slaughter reactors. At one time where the government man were doing the work there had gathered in excess of 500 persons to stop the animals from being tested. We have depositions from some persons who attended a meeting of the opposition the night before, at which they were admonished, including the women, to take clubs and pitch forks down to that dairy farm and stick a fork into the belly of the first man who laid a hand on a cow.

The sheriff was there with several of his deputies, and when he saw the crowd that had gathered he said, "Boys, better not do anything; somebody is going to get hurt." And he wisely called his men off, called together some of the leaders, and went into the little town nearby. In an office there he said, "Gentlemen, you had better call off that mob. These men are obliged to test these animals, and I am obliged to protect them while they are doing it. The first man who interferes with one of these men is going to cause trouble. Disband that crowd. We will come back tomorrow."

The crowd disbanded, the men went back the following day, and tested the herd, and there was no more disturbance.
But by a very wise move by the sheriff, I believe, bloodshed was averted.

We got to the point recently where we had to quarantine the animals which were reactors, the other animals with which they intermingled, and the product of all of them. The quarantine did not seem to suit the people against whom it was imposed, and they violated it, and we went to court and secured a restraining order, preventing them from violating it, and then they stopped. The opposing association, we are informed, paid for the milk that was destroyed from those reactor animals, so it was encouraging to those people to try to carry on and violate the law if they could.

We now have a preliminary injunction granted us by the court, prohibiting the organization, its membership, officers, employees, agents, from interfering directly or indirectly with the administration of the law. Under that we are proceeding. We expect that the latter part of this month, or possibly in January, we will be before the courts again, asking that the injunction be made permanent. We are charging conspiracy to violate the law. We hope for success.

The assistance that the government has rendered in the work in the State of California cannot be measured. And the excellent way in which our inspector-in-charge, Dr. W. E. Howe, has handled things has been marvelled at by the people out there. The patience that he has shown throughout the opposition we had to face, is something that we have marvelled at, and we appreciate it.

I would like to tell you that we will be able to finish our job out there by the first of July or the first of October next, or when this association meets again. I hope we can have it done by then, but I cannot assure you of it because we have thought several times that we had the opposition stopped, then a new technicality comes up and causes further delay. We have fourteen unmodified counties now, only three of which have any degree of tuberculosis. The other eleven I don't think would exceed one per cent, and most of those are being held up largely pending the testing of beef cattle, and we are doing that very rapidly at the present time. Three counties in a block there, and only small portions of those three counties, form the great part of the opposition.

The cities have been a little bit reluctant to pass ordinances providing for the sale of products only from tested animals, because they thought the wording of the state law was such that their ordinances might possibly be held in-
valid if they were challenged in court. We have slaughtered some where in the neighborhood of 300,000 head of cattle since the program started. In listening to broadcasts by the opposition I hear that California is apparently the only state in the Union where this work is not being done right, and therefore you men should all be complimented. Apparently you are all doing it exactly right. But we cannot see that we are doing it so much differently than you are, if at all.

The government, participating with us the same as it is participating with you, should clearly indicate to any thinking man that the work is being done the same out there as it has been done in other places where co-operation has been carried on. We are spending probably (some of us) more time in court than in our own offices or in the field, but it seems to have resolved itself into more of a legal fight than it has into a disease—control fight, and which ever way they want it we have to give it to them.

I hope next year, gentlemen, to be able to say that we are through with the job. All I can tell you is that we are doing our level best. We have worked as rapidly as we could under existing conditions.

I have no excuses to make for the State of California as a whole. Everything that seemed possible to do was done by the people behind our program, but we all know that we do not all think the same. The opinion of the objectors, if their objections are sincere, must be recognized; and if they are not sincere, naturally we cannot agree with them. And that is my story.

Mr. Chairman, I am grateful for this opportunity to tell our story to this body of men. We hope we will have a complete story to tell you next year when we meet again. (Applause.)

PRESIDENT WESTMORELAND: Thank you, Dr. Duckworth, for this splendid report on condition in California.

Next on the program is "Progress of Tuberculosis Eradication in Canada," by Dr. Orlan Hall, Health of Animals Division, Ottawa, Ontario, Canada. Due to the absence of Dr. Hall it will be read by Dr. R. H. Lay, District Veterinary Inspector, Winnipeg, Canada.

. . . Dr. R. H. Lay read the paper.
PROGRESS OF TUBERCULOSIS ERADICATION IN CANADA

By ORLAN HALL, Ottawa, Canada
Associate Chief Veterinary Inspector, Health of Animals Division, Department of Agriculture

In dealing with the progress of bovine tuberculosis eradication in Canada the records indicate that the control of this disease was receiving considerable attention as early as 1894. Dr. Duncan McEachran, who was then Chief Quarantine Officer for the Dominion, reported that tuberculosis was within the lines of possible eradication for a comparatively small outlay for inspectors, tuberculin and indemnity, and strongly recommended that Parliament be asked to vote the money necessary to rid Canada of this plague. His recommendations for the payment of compensation for reacting animals did not, however, receive favorable consideration.

The first control measures were adopted in 1896 and consisted of the free testing of herds with tuberculin. The demand for this service was not great but it gave the live stock owner an opportunity to become familiar with the test and at the same time afforded an opportunity of determining the extent of infection in herds.

The following year there was an indication that testing was beginning to be appreciated, and as it had been announced that owners could have their herds tested free of charge applications came in more freely.

The control measures of 1896 were carried out, at least to some degree, until 1901 when the policy was limited to the testing of importations from Europe and the United States, and cattle exported to the United States. Although quite a large number of cattle were tested during this period compensation was not paid for reactors.

The first appropriation for this work amounted to $20,000 and was expended for general administration, salaries, travel and supplies. Later Dr. McEachran endeavored to procure an appropriation of $100,000 for the control of tuberculosis but this was not granted. If the percentage of infection at that time was as low as estimated, and the amount requested had been granted, the subsequent expenditure of millions of dollars would have been avoided and the extension of infection reduced.

In 1902 arrangements were made whereby the department would supply free of charge to duly qualified veterinarians, upon the request of owners of cattle, such tuberculin as
might be required for testing purposes on condition that full and exact reports of the test be furnished to the department on forms provided for that purpose.

The permanent earmarking of all animals reacting to tuberculin was made compulsory in 1903 whether such reactions followed an official test or a test made by a veterinarians with tuberculin supplied by the department on the terms indicated above, and their exportation from Canada was prohibited.

In 1905 it was decided that no further official tests should be conducted except in the case of cattle imported or exported for breeding purposes and such herds as were placed under the control and supervision of the department.

Of outstanding importance was the inauguration of the meat inspection service in 1907. The detection of disease resulting in the condemnation of entire carcasses and parts of carcasses served to awaken public interest concerning the soundness of meat products for human consumption.

Following this, demands were made by some municipalities for a safer milk supply, which would involve the testing of cattle belonging to the dairymen retailing milk for human consumption. These demands were resented by the dairymen concerned and in some municipalities a milk famine was threatened if the testing of the herds were made compulsory. No action was, however, taken by the department.

As consumers of milk and public health bodies, continued this agitation for a safer milk supply, the Municipal Tuberculosis Order was passed in 1914. This order was adopted with a view to assisting municipalities to obtain their milk supply from tuberculin tested herds and was the Government's first policy which provided compensation for reacting cattle.

Under the provisions of this order municipalities were required to limit the milk supply to officially tested herds. Many dairymen, however, would not submit their herds to test and those in favor of the test could not produce an adequate milk supply; consequently the order was later amended to permit the sale of milk from untested herds, provided it was properly pasteurized. Two classes of milk were, therefore, distributed in the municipalities—(1) raw milk from tuberculin tested herds; (2) pasteurized milk.

While the order gained in popularity it soon became apparent that the desired progress was not being made in the control of tuberculosis, as, although many reactors were be-
ing slaughtered, centers of infection in untested herds remained.

The department no longer accepts municipalities under this order. Nevertheless it served in no small measure as a means of educating the public from a public health viewpoint, and created an increased demand for milk from tuberculin tested herds whether pasteurized or not.

It was known that many pure bred herds throughout the Dominion were badly infected and that owners of grade cattle, who were desirous of improving their herds were purchasing pure bred bulls, and others were purchasing pure bred heifers and mature cows with a view to establishing pure bred herds. As many of these pure bred animals were infected, centers of infection were increasing; consequently in 1919 the department decided to adopt the accredited herd plan, which was the second policy providing compensation for reacting cattle.

The object of the accredited herd plan is the eradication of tuberculosis from pure bred breeding herds. There have been changes from time to time since the adoption of this policy in regard to the number of registered cattle which a herd must contain in order to be accepted for accreditation, and at the present time a herd must contain at least five pure bred cattle, of one breed, registered in the name of the owner, and this number must comprise at least one-third of the herd, pure breds and grades included. An accredited herd certificate is not issued or renewed unless there are at least ten pure bred registered cattle in the herd. All tests of such herds are conducted by veterinary inspectors of the Health of Animals Division.

There are at the present time 9,207 herds, comprising 276,210 head of cattle, receiving attention under this plan. Soon after its adoption this plan proved popular, as the stock owner recognized that the demand for clean cattle was on the increase, and if he were to remain in business it would be necessary to eradicate tuberculosis from his herd.

As experience was demonstrating that tuberculosis could be eradicated, stock owners in general were expressing a desire for a still more aggressive campaign; consequently it was decided to adopt the restricted area plan in 1922. This was the third policy providing compensation for reacting cattle.

This plan has proved so popular with the stock owner that it is becoming increasingly difficult to satisfy the demand.
Areas have been established in all provinces of the Dominion except one.

Counties or rural municipalities are not accredited or re-accredited unless all cattle within them have been submitted to a tuberculin test by veterinary inspectors of the Health of Animals Division, and the percentage of cattle reacting to tuberculin reduced one-half of one per cent or less.

The supervised herd plan, which was adopted in 1905, is still in existence. It is a single herd policy applicable to grade herds irrespective of the number of pure bred or grade animals in them. No compensation is paid for reactors but the owners receive whatever proceeds there may be from the salvage. Stock owners who do not reside in restricted areas, or who cannot take advantage of the accredited herd plan, can have their herds tested under the supervised herd plan. At the present time 47,464 herds, comprising 569,568 cattle, are receiving attention under this plan. All tests of these herds are conducted by veterinary inspectors of the Health of Animals Division.

The cattle population of the Dominion of Canada is approximately 8,840,500, and of this number 3,131,601, or 36 per cent, are under the department's supervision for the eradication of tuberculosis.

Since the inception of our compensation policies 340,768 reactors have been slaughtered at a compensation cost of $11,940,095.

Compensation is based on two-thirds of the valuation placed upon the animals by veterinary inspectors of the Health of Animals Division. The maximum amount of compensation permitted under the Animal Contagious Diseases Act is $100 for pure bred and $40 for grades. All reactors must be slaughtered under federal inspection. The salvage in all cases belongs to the owner.

In the provinces of Prince Edward Island and New Brunswick 100 per cent of the cattle have been tested, 88 per cent in the province of Nova Scotia, 62 per cent in the province of Quebec, 36 per cent in the province of Ontario, 26 per cent in the province of Manitoba, 21 per cent in the province of Saskatchewan, 3 per cent in the province of Alberta and 21 per cent in the province of British Columbia.

Of 2,268,876 cattle receiving attention under the area plan 881,629 are in counties or rural municipalities where the number of cattle reacting to tuberculin has been reduced to one-half of one per cent or less, and of the 9,207 herds, comprising
276,210 cattle, under the accredited herd plan, 8,356, comprising 250,680 head of cattle, are fully accredited.

As previously stated, 47,464 herds, comprising 569,568 head of cattle, are receiving attention under the supervised herd plan; 43,885 of these herds, comprising 526,620 head of cattle, have never had a reacting animal.

It is significant that although not more than 36 per cent of cattle in Canada have been tested approximately 55 per cent of the human population is so located that they are privileged to consume milk from tuberculin tested cattle.

At the present time there are 650,000 head of cattle awaiting initial test under the area plan, 3,000 under the accredited herd plan and 37,392 under the supervised herd plan, or a total of approximately 690,000. It can, therefore, be clearly seen that we are fast approaching the half-way mark in our campaign.

As a result of our efforts the incidence of infection is decreasing and it is estimated that the percentage of tuberculous cattle in Canada at the present time does not exceed 3 per cent.

Tuberculosis in swine originating in restricted areas is still found on post-mortem at abattoirs under federal inspection. Typing experiments have been carried out which would indicate that almost 100 per cent of these cases are due to avian infection.

Although avian tuberculosis is known to be quite prevalent in some districts no action has been taken by the department to control the disease other than to advise owners, whose herds of cattle are under its supervision, of the procedure to be followed in eradicating the disease from their poultry flocks.

PRESIDENT WESTMORLAND: Thank you, Dr. Lay, for reading Dr. Hall’s contribution to our program.

We will call for the report of the Committee on Tuberculosis at this time. Dr. Smith, Chairman of that Committee.

. . . Dr. R. W. Smith, Chairman, read the report of the Committee on Tuberculosis.

REPORT OF THE COMMITTEE ON TUBERCULOSIS

DR. R. W. SMITH, Chairman, Concord, N. H.

Dr. A. E. Wight, Washington, D. C. Dr. George Hilton, Ottawa, Ont.
Dr. E. T. Faulder, Albany, N. Y. Canada.
Dr. H. A. Seidel, Des Moines, Ia. Dr. C. U. Duckworth, Sacramento, Calif.
Dr. J. L. Axby, Indianapolis, Ind.
At the Fortieth and Forty-First Annual session of this Association, your Committee on Tuberculosis recommended that Government T. E. Form 15-C be discontinued; said recommendation was approved by this Association and forwarded to the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., for consideration. Your Committee is pleased to report at this time that on June 1, 1938, the provision in the Federal Regulations pertaining to the Interstate movement of semi-range and range cattle, steers and spayed heifers was revoked. Therefore, the use of T. E. Form 15-C has been discontinued.

Your Committee further desires to call your attention to the fact that the Federal Regulations governing the importation of cattle from Canada has been amended. This action was taken July 1, 1938, and provides that all cattle, unless imported for slaughter, shall be accompanied by a satisfactory certificate of tuberculin test applied within 30 days of the date of importation, unless such cattle originate in a modified accredited area or from an accredited tuberculosis free herd.

Having in mind that all counties in all states will have been declared modified accredited areas by December, 1939, your Committee recommends that the 1939 Committee on Tuberculosis, in cooperation with the Bureau of Animal Industry, rewrite the uniform methods and rules for the establishment and maintenance of tuberculosis-free accredited herds of cattle, and modified accredited areas, and presents same to this Association at our next annual meeting for approval and submission to the Bureau of Animal Industry for their further consideration.

Mr. President, this report has been signed by the Committee. I move the adoption of this report.

PRESIDENT WESTMORLAND: Thank you, Dr. Smith. This report will be acted upon by the body with the reports which have been read and approved by the Executive Committee.

We will now drop back to complete a part of our program. Dr. Hurt, we will now have the report of the Special Committee on Inspection of Poultry and Rabbit Meat.

. . . Dr. L. M. Hurt, Chairman, read the report of the Special Committee on Inspection of Poultry and Rabbit Meat.

REPORT OF SPECIAL COMMITTEE ON POULTRY AND RABBIT-MEAT INSPECTION

By Dr. L. M. Hurt, Chairman, Los Angeles, Calif.

Dr. R. W. Smith, Concord, N. H. Dr. Chas. E. Cotton, St. Paul, Minn.
Dr. C. E. Edmunds, Chicago, Ill. Dr. F. A. Zimmer, Columbus, Ohio

Your committee recommends as follows:

That the United States Live Stock Sanitary Ass’n formulate and present for consideration of its several members, especially those actively engaged in supervising the inspection of meats and meat products, a plan for the extension of such inspection to cover the preparation of poultry and rabbits for market. Such plan should include minimum requirements pertaining to type and condition of buildings and equipment; methods used in preparation, handling and storage of poultry
and rabbits; rules and regulations covering ante-mortem and post-mortem inspection, including the several conditions for which inspection is conducted, symptoms and lesions to be observed, and judgment to be rendered in each case.

Factual material relative to meat inspection as it applies to poultry and rabbits should be presented to all associations of poultry and rabbit breeders, farmers, marketing associations, etc., poultry and rabbit division of Farm Bureaus, Agricultural Committees of Chambers of Commerce, etc., so that they may be acquainted with the part inspection should play in the future development of the preparation of poultry and rabbit meat. This educational work should be made to appear in the light of a means to increase sales as much as to insure the condemnation of diseased or unfit carcasses. Probably the less said about reasons for condemnation the better, but a great deal may be presented in favor of the improved methods which are already being utilized in New York, Ft. Wayne, Ind., Seattle, Wash., et al., and the enthusiastic reception of these products by the consuming public foretells the trend of opinion toward more general use of completely drawn and dressed birds and rabbits.

As the first step in gathering information upon which we might make suggestions to these individuals and organizations, your committee further recommends that a questionnaire be forwarded to the several Federal, State and Municipal Departments vested with authority to inspect meat and meat products and gain from them as much information as possible upon the following:

a. Extent to which poultry and rabbit packing is being conducted at present.

b. Extent to which it could be centralized for the purpose of more careful and complete dressing under inspection.

c. Local difficulties that might be anticipated in establishing inspection of poultry and rabbit meats.

d. Departments or agencies which could or should assume the responsibility for such inspection.

e. The names and address of prominent breeders, associations of breeders and marketing associations. These should be acquainted with the need for such inspection in the preparation of safe and desirable meat products.

In some states the matter of establishing market classes and grades of poultry is being seriously considered either on the basis established by the Bureau of Agricultural Economics, or closely following same. It is therefore none too soon to advise general adoption of provisions for adequate inspection of poultry and rabbit meat.

Those of you who are interested in getting copies of the table, or the standard established by the Bureau of Agricultural Economics, may secure them by asking for the classifications and tentative specifications for United Standards and Grades for Dressed Chickens. (Applause.)

PRESIDENT WESTMORLAND: Thank you, Dr. Hurt. This report has been approved and accepted by the Executive Committee, and will come up with the other reports to be voted upon.

We will have the report of the Committee on Policy, read by Dr. John R. Mohler.
Dr. John R. Mohler, Washington, D.C.: Mr. Chairman and fellow members, this afternoon I am pitch-hitting for Dr. Butler of Montana. Several months ago he wrote me that he would be unable to be here this afternoon, and suggested that I write a report. So I shall read this report of the Committee on Policy.

... Dr. Mohler read the report of the Committee on Policy.

REPORT OF THE COMMITTEE ON POLICY

Dr. W. J. Butler, Chairman, Helena, Mont.

Dr. John R. Mohler, Washington, Dr. Adolph Eichhorn, Pearl River, N. Y.
Dr. Ward Giltner, East Lansing, Dr. L. Van Es, Lincoln, Nebr.
Mich.

The United States Livestock Sanitary Association, through its Committee on Bang's disease, has expressed the opinion that uniformity in preparation and use of antigen to detect Bang's disease in cattle is of paramount importance. Therefore the Committee on Policy desires at this time to recommend that this Association approve a policy which we hope will accomplish this result.

It is generally recognized that the eradication of tuberculosis has been greatly facilitated by the use of tuberculin prepared by the United States Bureau of Animal Industry for use solely in official work. By this arrangement it was possible to provide uniformly active tuberculin of identical standard as a diagnostic agent in the cooperative work of tuberculosis eradication.

A number of state officials and other interested agencies have voiced a desire for a similar arrangement for the preparation of the antigen used for official testing of cattle for Bang's disease, especially since discrepancies in the results of the tests are sometimes observed when antigens are prepared in different laboratories.

Your Committee has contacted the United States Bureau of Animal Industry with the view of having the latter prepare and distribute Bang's diseases antigen that will be used solely in official cooperative work throughout the country and has obtained a favorable reaction to this proposal.

It is therefore recommended that this Association express the desire that all State regulatory officials in charge of Bang's disease control work likewise give favorable consideration to this movement and endorse the project in order to establish greater uniformity and increased efficiency wherever possible.

President Westmorland: Thank you, Dr. Mohler, for this report. We are always glad to have you with us. What is the pleasure of the body?

Dr. Axby: Mr. President, as Chairman of the Executive Committee I move the acceptance and adoption of the report.

Dr. Curry: I second the motion.

... The motion was voted upon and carried unanimously.
PRESIDENT WESTMORLAND: Next on the program is the report of the Committee on Legislation, Dr. Charles E. Cotton, Chairman.

... Dr. Cotton read the report of the Committee on Legislation.

REPORT OF THE COMMITTEE ON LEGISLATION

DR. CHAS. E. COTTON, Chairman, St. Paul, Minn.

Dr. William Moore, Raleigh, N. C. Dr. C. D. Stubbs, Little Rock, Ark. Dr. J. M. Sutton, Atlanta, Ga. Dr. L. M. Hurt, Los Angeles, Calif.

Following the plan of last year, the committee communicated with the Livestock Sanitary officials of all the states requesting copies of laws that had been enacted since 1937, and received reports from 38 states and Los Angeles County, California. Reports were not received from California (excepting Los Angeles County), Idaho, New Hampshire, Washington, Pennsylvania, Rhode Island, South Carolina, Wisconsin, Wyoming and North Dakota. The reports disclosed that the legislature convened in six of the states during the calendar year 1938.

Officials of six states reported enactment of laws as follows:

Louisiana—Acts covering compulsory Bang's disease eradication; compulsory sheep scab eradication and control of auction sales including bond under the supervision of the Live Stock Sanitary Board.

Maryland—Did not enact any laws but the legislature appropriated $100,000 a year for state indemnity for Bang's disease.

Massachusetts—Acts providing for the agglutination blood test Bang's disease requirements for imported cattle calfhood vaccination under state supervision and the law providing for the expense of quarantine in connection with control of rabies.

Mississippi—Appropriated the sum of $25,000 to match Federal funds to pay owners of cattle that react to tuberculosis, para-tuberculosis and Bang's disease test that are condemned and slaughtered; this law became effective on July 1, 1938.

New York—Enacted three laws; an enactment providing for the control of pillorum diseases; revised the law making it lawful for County Board Supervisors to appropriate county funds for the control of bovine tuberculosis, and other infectious and communicable diseases of domestic animals and fowls; and also a law relating to the sale of baby chicks; the legislature appropriated $300,000 to indemnify owner of cattle ordered destroyed on account of Bang's disease. This sum was included in the Governor's budget and the legislature included in the appropriation bill the authority of the Commissioner of Markets to apply blood tests for Bang's disease and pay indemnity on the same basis that is ordered for cattle destroyed account of tuberculosis.

Virginia—Enacted a law amending the Code by adding 14 new sections relating to the prevention, control and eradication of contagious and infectious diseases of livestock and poultry. The new legislation was approved April 1, 1938. Dr. H. C. Given, the State Veterinarian, in his communication to the committee stated that he would be glad if we will let him know next spring if another state passes a law as good as the Virginia law.
A number of states reported the adoption of rules and regulations that have the effect of law with particular reference to the requirements of importation of cattle, control of livestock community sales, and stock yards and feeding yards.

RECOMMENDATIONS

Your committee submits the following recommendations:

(a) An Act of Congress adopted in June, 1938, provides that the Federal government will not pay indemnity for cattle that react and are condemned and slaughtered for Bang's disease on and after May 1, 1939, unless the states pay an equal amount.

In the majority of states appropriations are made for the fiscal year that terminates June 30. The legislatures of the majority of states will convene in 1939. However, as the tax rate for the present fiscal year has been established and levied, it is very difficult to succeed in obtaining emergency appropriations for the balance of the fiscal year terminating June 30, 1939. The legislative bodies of some of the states, including Kentucky, will not convene until 1940.

This will result in a number of the states being forced to lose the material benefits that the cattle industry has received as a result of the work done since 1934, and also the benefits of the expenditure of large amounts of federal funds, provided the work is discontinued on May 1, 1939, and is not re-established until after the various states can appropriate the necessary funds.

Your committee recommends that this Association respectfully request Congress to amend the Act, whereby Federal indemnity will be paid until July 1, 1940, without the requirement that the states pay an equal amount for indemnity.

(b) Congress enacted a law in June, 1938, prohibiting the movement of adulterated and misbranded food, drugs, devices and cosmetics. The National Drug Trade Conference at its recent annual meeting approved a model State Drug and Cosmetic law, patterned on the newly enacted Federal Food and Drug Act.

It is recommended that the members of this Association contact and co-operate with the Druggists Association in the various states in order that state legislation may be enacted preventing the sale, distribution and use of fake nostrums and agents of questionable value to the live stock and poultry industry.

(c) For a number of years this Association has endeavored to have regulatory officials of all states adopt uniform rules and regulations governing the interstate movement of live stock.

We have repeatedly requested the Secretary of the United States Department of Agriculture to adopt regulations controlling the movement of live stock interstate. We realize that because conditions differ in the various parts of the country, it was impracticable for the Secretary to adopt a regulation that would be acceptable and include requirements to meet the conditions in the various parts of the country.

In 1919 the Secretary of the United States Department of Agriculture adopted Regulation 7, providing for the inspection and issuance of health certificates for cattle to be moved interstate for the control of tuberculosis. Since 1934 the Federal Government has spent large sums of money in co-operation with the various states in the control and elimination of Bang's disease. Practically every state in the
Union now has regulations pertaining to the inspection and certification of cattle in controlling Bang's disease. These regulations are not uniform.

The committee recommends that the Association request the Secretary of the United States Department of Agriculture to promulgate and adopt a regulation governing the interstate movement of livestock for the control of Bang's disease.

PRESIDENT WESTMORLAND: Thank you, Dr. Cotton. You have heard the report of the Committee on Legislation. What is your pleasure?

DR. HURT: I move it be accepted and approved.

DR. AXBY: I second the motion.

. . . The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: Next will be the report of the Committee on Resolutions, Dr. Jacob, Chairman. Dr. Campbell is not here. Dr. Axby will you read the resolutions? I believe it is necessary to have them read.

. . . Dr. Axby read Resolutions No. 1 and 2.

REPORT OF THE RESOLUTIONS COMMITTEE

DR. M. JACOB, Chairman, Knoxville, Tenn.
Dr. D. M. Campbell, Chicago, Ill. Hon. Chas. F. Riordan, Boston, Dr. H. E. Curry, Jefferson City, Mo. Mass.

RESOLUTION No. 1

Whereas, The eradication and control of animal diseases in the United States has progressed to the present state of effectiveness only through great public effort and cost; and

Whereas, Foot-and-mouth, as well as other communicable diseases not now existing in this country, have in the past caused great losses to the live stock industry of the United States; and

Whereas, These diseases still exist and are causing heavy losses in many foreign countries; therefore, be it

Resolved, That this Association continue its opposition to the establishment of commercial relations with any country in which foot-and-mouth disease is indigenous of a nature permitting the importation of products, likely to introduce, or capable of introducing, these diseases in the United States; and be it further

Resolved. That this Association strongly urges the continued maintenance of such sanitary restrictions as will adequately and completely safeguard the live stock industry of the United States against the introduction into this country of any communicable diseases of animals.

RESOLUTION No. 2

Whereas. Live stock regulatory officials, veterinary practitioners, live stock owners, public health workers, and others interested in animal disease control measures do not have available any recognized, regularly issued publication which can be relied upon to furnish up-to-date information on regulatory measures; and
Whereas, The United States Live Stock Association should be the source of information on all matters pertaining to live stock sanitary control measures, including those pertaining to food, hygiene; therefore, be it

Resolved, That the President of this association be instructed to appoint a committee of three (3) to study the possibilities of this association, issuing such a publication at least twice each year, and that the committee be requested to report their findings and recommendations during the next annual meeting.

These resolutions have been acted upon by the Executive Committee, and have been accepted and approved.

PRESIDENT WESTMORLAND: You have heard the reading of the resolutions. What is your pleasure?

MR. H. R. SMITH (Illinois): I would like to offer an amendment (if it is not out of order) which pertains to the interstate movement of cattle from modified accredited counties. According to the way the recommendations were read, I believe it eliminates breeding cattle. I would like to amend to have it include breeding as well as feeding cattle.

I offer the amendment that it be changed to correspond to the United States Bureau of Animal Industries' regulation, which I know permits the movement of cattle from modified accredited counties from one state to another without the application of the tuberculin test if they originate in an accredited area and are accompanied by certificate.

If they come in from a range county they are admitted by a signed statement from the owner. I feel that farmers throughout the United States have been very good co-operators in this movement. The market interests have also been behind it and have added a great deal to the strength of the whole movement. It seems to me that we are adding a great deal of expense to the cattle owners if the states require special tests, not only expense but delay in movement.

I want to call your attention to the statement made by Dr. Wight, that of 176,000 cattle tested for interstate movement last year to comply with certain state requirements, only 95 or .05 per cent, reacted too small a number to justify the expense and delays for these special tests. Tuberculosis is nearly eradicated from the herds of the United States with the exception of fourteen counties in California. The records show a very small number of cattle condemned for tuberculosis in the United States last year. We had only 331 condemned for tuberculosis at all plants in Chicago last year. I happen to know that in one dairy state on the last test, less than one-tenth of 1 per cent of the cattle reacted. There are many counties in which no reactors were found on the last test. I hope this can be amended so that we can recommend to the states that all cattle be allowed to move from modified accredited counties without special tests at the time of entry. I am only asking that this recommendation be made to correspond with the present Bureau regulations. It is only a recommendation, but it seems to me that with all the study given to this by the U. S. Bureau of Animal Industry, we ought to accept their judgment and make it a recommendation to the various states. I would like to see this adopted as an amendment.

PRESIDENT WESTMORLAND: Dr. Smith, these resolutions have been approved and accepted by the Executive Committee, and referred to this organization for adoption. Any amendment would necessarily
have to be made by the Executive Committee before presentation to this body, and at this time it will be impossible to amend one of the resolutions.

MR. H. R. SMITH: It is my understanding that on the floor of the convention there is always an opportunity to make amendments to resolutions.

PRESIDENT WESTMORLAND: There will not be another meeting of the Executive Committee at this annual meeting, and these resolutions could only be approved or disapproved by them, adopted or not adopted by this body. After they are approved by the Executive Committee any amendment would necessarily have to refer them back to the Committee.

MR. SMITH: It is an unusual procedure. The floor of the convention always has precedence.

PRESIDENT WESTMORLAND: Is there any other discussion?

If not, what is the pleasure of the body with regard to the report of the Committee on Resolutions?

DR. HURT: I move its adoption.

DR. AXBY: I second the motion.

The motion was voted upon and carried.

PRESIDENT WESTMORLAND: The report of the Committee on Tick Eradication, by Dr. Booth, Chairman, has been read before this body and has been approved and accepted by the Executive Committee. What is the pleasure of this body in regard to this report?

DR. W. H. HENDRICKS (Utah): I move the report be adopted by this body.

DR. H. D. PORT (Wyoming): I second the motion.

The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: Report of the Committee on Revision of Constitution and By-Laws. This report has been accepted and approved by the Executive Committee, and awaits adoption of this body. What is your pleasure?

DR. HURT: I move its adoption.

DR. AXBY: I second the motion.

The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: Next is the report of the Committee on Tuberculosis. You have heard Dr. Smith read this report. It has been approved and accepted by the Executive Committee. What is your pleasure?

DR. PORT: I move its adoption.

DR. HURT: I second the motion.

The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: The report of the Special Committee on Inspection of Poultry and Rabbit Meat. You heard this report read by Dr. Hurt, and it has been accepted and approved by the Executive Committee. What is your pleasure?

DR. HENDRICKS: I move it be adopted.

DR. E. T. FAULDER (New York): I second the motion.

The motion was voted upon and carried unanimously.

PRESIDENT WESTMORLAND: Report of the Committee on Transmissible Diseases of Poultry. What is your pleasure?
COMMITTEE ON LAWS AND REGULATIONS

DR. FAULDER: I move it be adopted by this body.

DR. PORT: I second the motion.

. . . The report was voted upon and carried unanimously . . .

PRESIDENT WESTMORLAND: Report of the Committee on Meat and Milk Hygiene. Dr. Schalk's report. This report has not been read before this organization, but has been approved by the Executive Committee. Pardon me—Dr. Day says the report has been read before this body. What is your pleasure?

DR. AXBY: I move that it be adopted.

DR. PORT: I second the motion.

. . . The motion was voted upon and carried unanimously . . .

PRESIDENT WESTMORLAND: Report of the Special Committee on Unification of Interstate Certificate Blanks. Dr. Moore is Chairman of that Committee. This report was read before this body and approved and accepted by the Executive Committee. It is now up for adoption by this body. What is your pleasure?

DR. PORT: I move its adoption.

DR. AXBY: I second the motion.

. . . The motion was voted upon and carried unanimously . . .

PRESIDENT WESTMORLAND: We will now have the reading of the report of the Committee on Unification of Laws and Regulations, by Dr. Port, Chairman.

DR. PORT: The report of the Committee on Uniform Laws and Regulations has been divided into three subdivisions.

REPORT OF THE COMMITTEE ON UNIFICATION OF LAWS AND REGULATIONS

DR. H. D. PORT, Chairman, Cheyenne, Wyo.

DR. D. M. CAMPBELL, Chairman, Sub-Committee, Chicago, Ill.

Dr. W. H. Hendricks, Salt Lake Dr. R. A. Hendershott, Trenton, N. J.

City, Utah.

Dr. W. F. Biles, Frankfort, Ky. Mr. W. G. West, Topeka, Kans.

SUBDIVISION “A” OF THE COMMITTEE REPORT

For many years laws, rules and regulations have been formulated governing the importation of live stock into the various states. In certain instances such regulations have materially interfered with the movement of live stock interstate for the following reasons:

1. At times facilities at the point of origin are not adequate for holding live stock, nor for restraining live stock for testing. Further, veterinary service is not always available or would require traveling long distances, making the expense of inspection a burden upon the shipper.

2. Many states have laws and regulations still in existence that are obsolete and unnecessary and should be amended or revoked. It is an established fact that impracticable regulations, or unenforceable regu-
lations, lead to violations which jeopardize the observance of important and necessary regulations.

3. Certain laws and regulations act as an embargo against the importation of live stock from other states.

4. Except for truckers, transportation companies have patiently cooperated for years in helping to enforce livestock regulations, and at this time find it difficult to interpret the many regulations now in existence.

For the above mentioned reasons, and as it is the primary responsibility of the United States Live Stock Sanitary Association in bringing about the adoption of uniform laws, rules and regulations respecting the United States Bureau of Animal Industry in various states pertaining to the interstate movement of livestock, and as this committee feels that no beneficial results can be obtained unless the organization empowers a special committee to summarize the various laws and regulations governing the interstate movement of livestock and present a draft of practical and as nearly as possible uniform laws and regulations; therefore, your committee recommends that a special committee composed of state live stock sanitary officials representing various sections of the United States be appointed, and that they be requested to make an investigation and study of the various state live stock laws and regulations, including the Bureau of Animal Industry regulations pertaining to the interstate movement of live stock.

It is further recommended that this committee, as a result of this study, formulate a model and as nearly as possible uniform set of rules and regulations and present them to the Executive Committee of the United States Live Stock Sanitary Association for their consideration.

It is further recommended that the Executive Committee of the United States Live Stock Sanitary Association authorize the Secretary to pay the necessary expense that this special committee will incur in carrying out their assignment, and that the committee's report be presented at the next regular meeting of this Association.

Mr. President, this is subdivision "B" of the committee report.

SUBDIVISION "B" OF THE COMMITTEE REPORT

Whereas, Practically all counties in the United States are now modified, accredited, tuberculosis free areas; and

Whereas, cattle in all counties of the United States are being regularly tested for reaccreditation; and

Whereas, certain states do not permit the entry of cattle from modified, accredited counties, as provided in regulations of the United States Bureau of Animal Industry pertaining to the interstate movement of live stock; therefore,

Be It Resolved, that the United States Live Stock Sanitary Association urge all states to adopt bovine tuberculosis regulations on feeding cattle of beef breeds identical to the United States Bureau of Animal Industry's Regulations Governing the Interstate Movement of Live Stock.
Whereas, the regulations for the interstate movement of sheep into some states differ for sheep from different sources or points of origin in like territory.

Be It Resolved, that we urge upon the live stock sanitary authorities of all states that uniform requirements be established for the importation of sheep from public markets, auction sales, direct from the range or any other source from like territory.

Mr. Chairman, I move the adoption of this report.

PRESIDENT WESTMORLAND: You have heard the report of the Committee on Unification of Laws and Regulations. What is your pleasure?

DR. CURRY: I move, Mr. Chairman, that sections "A," "B" and "C" of the report as read be adopted.

DR. AXBY: I second the motion.

. . . The motion was voted upon and carried unanimously. . . .

PRESIDENT WESTMORLAND: Report of the Committee on Transmissible Diseases of Swine. This report was made by Dr. McBryde. It has been accepted and approved by the Executive Committee and is before you for adoption. What is your pleasure?

DR. FAULDER: I move the report be adopted.

DR. HURT: I second the motion.

. . . The motion was voted upon and carried unanimously . . .

PRESIDENT WESTMORLAND: Report of the Committee on Rabies. Dr. Rinehart read this report. It has been accepted and approved by the Executive Committee. What is your pleasure?

DR. FAULDER: I move the adoption of the report.

DR. HENDRICKS: I second the motion.

. . . The motion was voted upon and carried unanimously . . .

PRESIDENT WESTMORLAND: Next is the report of the Committee on Public Relations. This report has been read before this body and has been accepted and approved by the Executive Committee. What is your pleasure?

DR. AXBY: I move its adoption.

DR. HURT: I second the motion.

. . . The motion was voted and carried unanimously . . .

PRESIDENT WESTMORLAND: Report of the Committee on Bang's disease. This report was made by Dr. Fitch. It has been read before this organization, and has been accepted and approved by the Executive Committee. What is your pleasure?

DR. FAULDER: I move the report be adopted.

DR. HALES: I second the motion.

. . . The motion was voted and carried unanimously . . .

PRESIDENT WESTMORLAND: We will have the report of the Auditing Committee, by Dr. Charles E. Cotton, Chairman.

. . . Dr. Cotton read the report of the Auditing Committee.
REPORT OF THE AUDITING COMMITTEE

DR. CHAS. E. COTTON, Chairman, St. Paul, Minn.

Dr. H. C. Rinehart, Springfield, Ill. Dr. F. A. Zimmer, Columbus, Ohio

Your committee have examined the records of the Secretary and Treasurer and find them correct.

This year is the first in history of the Association in which all states are members and have paid the state dues.

The records of the Secretary and Treasurer are complete, and the committee finds he has handled the business of the Association conscientiously and efficiently.

PRESIDENT WESTMORLAND: What is your pleasure regarding this report?

DR. AXBY: I move it be adopted.

DR. HURT: I second the motion.

... The motion was voted upon and carried unanimously ...

PRESIDENT WESTMORLAND: It has been necessary, because of the length of our programs and discussions, to eliminate all surplus comment by the Chair, and complimentary remarks may have been neglected. But this does not indicate disrespect. It was done merely to conserve time. Now I wish to thank each individual who has participated in our deliberations.

Next on our program is the Election of Officers. We will have the report of the Nominating Committee, Dr. Faulder, Chairman.

... Dr. Faulder read the report of the Nominating Committee.

REPORT OF THE NOMINATING COMMITTEE

DR. E. T. FAULDER, Chairman, Albany, N. Y.

Dr. H. E. Curry, Jefferson City, Dr. A. C. Topmiller, Nashville, Tenn.

For a number of years it has been the policy of this Association for the President to appoint a Nominating Committee, to place in nomination, officers for the coming year.

The Nominating Committee appointed by President Westmorland, wish to make the following recommendation for officers for the ensuing year:

For President—Dr. J. LEONARD AXBY, Indianapolis, Ind.
For First Vice-President—DR. H. D. PORT, Cheyenne, Wyo.
For Second Vice-President—DR. I. S. McADORY, Auburn, Ala.
For Third Vice-President—DR. F. A. ZIMMER, Columbus, Ohio.
PRESIDENT WESTMORLAND: You have heard the report of the Nominating Committee. Are there any other nominations?

DR. HARRY B. LEONARD (New York): I move that nominations be closed and that the Secretary be instructed to cast one unanimous ballot for the above named officers.

. . . The motion was severally seconded, voted upon and carried unanimously. . . . (Applause.)

SECRETARY DAY: According to your vote, I now cast one unanimous ballot for this organization for the candidates named.

PRESIDENT WESTMORLAND: We will now have the installation of officers.

. . . The newly elected officers were escorted to the platform, and the audience arose and applauded. . . .

PRESIDENT WESTMORLAND: Dr. Axby, you have had conferred upon you the highest honor given by this Association, and we are convinced that our selection has been a wise one. Not only have you been especially qualified from an intellectual standpoint, but your excellent work in this organization merits your elevation to the office of President. (Applause.)

Dr. Port, you have been elected First Vice-President of this organization. Your duties will be to act as Chairman of the Executive Committee, to assist the President, and to carry out the word of the Association's Constitution and By-Laws. (Applause.)

We will hear from Dr. Axby.

DR. AXBY: Mr. President, Members of the Association, Ladies and Gentlemen: I believe that if ever there was a time in my life when I endeavored to be absolutely sincere it is on this occasion. Perhaps it is not necessary for me to say to you that I have accepted other positions previous to this which I was appreciative of, and in which I recognized the honor bestowed upon me: I want this expressly understood: On this occasion, after these years of association with you, and in full recognition that this Association is composed of a personnel constituted of members from the United States and also from that friendly, lovable nation to the north, Canada, and also Mexico and Cuba, I associate that idea with the thoughts, hopes and aims and aspirations of those in governmental positions today in North America who hope to bring about a more friendly union among those countries as well as the things we have been striving for, for so many years in our own Union, whereby we hope to bring about a more perfect union.

I can but say that in performing the duties of this office I shall do the best I can not only to bring about a more pleasant, perfect union of these 48 states, but also a more friendly relation so far as it be humanly possible between these countries.
I am sure, my friends, that this is a wonderful privilege, and I am also sure that there are duties to be performed that I cannot do alone. Whether you know this or not, I believe that the only way in the world to have a friend is to be a friend. I shall continue that aim so long as I shall live.

In this ensuing year, recognizing that my predecessors have set a high mark for which I am to shoot, I can say only that I want our administration to be comparably as good as some of those which have gone into history. And it is upon you I shall call. I hope that you will accept the responsibilities and assignments I shall give you. I feel satisfied you will, and then, when another year will have rolled around, my principal hope—my prayer, my sincere desire—will be that this next year, when it is recorded in history, will go down as one of a sincere although humble effort of your individual friend, and with your co-operation I am sure it will be a success.

To all of you I wish good health and lots of happiness. May I say in all sincerity that when this next year will have rolled around there will not be one man or the wife of any man who is a member of this Association who will have been called to that bourne from whence no traveler ever returns.

I am indeed grateful to you all. I hope I shall measure up. Thank you very kindly. (Applause.)

PRESIDENT WESTMORLAND: Thank you, Dr. Axby. Now we will hear from Dr. Port. (Applause.)

DR. PORT: Gentlemen, I do sincerely appreciate the honor you have conferred upon me, giving me an opportunity to serve as your First Vice-President. I feel sure by your continued co-operation with our most able President that we will continue to render a valuable service to the live stock industry in this country.

Again I thank you, and look forward to seeing you all next year. (Applause.)

PRESIDENT WESTMORLAND: Dr. Day, it is a pleasure to install you again as Secretary-Treasurer of this Association. Your work in this office has been outstanding. I wish to thank you personally for the many courtesies shown me during the past year. We will hear from Dr. Day. (Applause.)

SECRETARY DAY: I trust I will be able to serve you this coming year as I have in the past; in fact more ably than I have heretofore. I have been told by a number of members that this is the best meeting the Association has experienced for a number of years. I feel that is true. It is due only to the tireless work and the sincere efforts that the Chairmen of the various Committees have rendered. All the credit should be given to the various Committee Chairmen. I trust we will have the happy co-operation of the Chairmen of the various Committees in the year to come and I hope we shall all be together next year. (Applause.)
PRESIDENT WESTMORLAND: Dr. Axby, during the past year you have been of wonderful assistance to me personally in the office of President of this Association, and I hope that I can be of some assistance to you in your coming administration, although I know it will be impossible for me to render as much service to your administration as you have rendered to mine.

I now deliver to you a copy of the Constitution and By-Laws of this Association, and the gavel which is a symbol of authority and responsibility. May you guard them well. (Applause.)

... Dr. Axby assumed the Chair as President. ...

PRESIDENT AXBY: Thank you. I have said all I have to say. The only thing I want to impress upon you is that I am not assuming this position with any spirit of exaggerated ego. It is in all humbleness that I take this office. Again I ask for your co-operation. I am sure if you will give me that help which would measure up comparably with that friendship which you have made manifest so many times, that I will have reason to be proud when I turn over the badge of authority to my successor.

Is there anything further to come before this Association? Is there any unfinished business? Hearing none, the Chair will entertain a motion for adjournment.

HON. RIORDAN: I move that we adjourn.

DR. FAULDAR: I second the motion.

... The motion was voted upon and carried unanimously, and the convention adjourned sine die at four o'clock. ...