Proceedings
FIFTY-THIRD
ANNUAL MEETING
of the
UNITED STATES
LIVESTOCK SANITARY
ASSOCIATION

HOTEL NEIL HOUSE
Columbus, Ohio
October 12, 13, 14, 1949
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1950

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J. T. Schwab, Madison, Wisconsin
HISTORICAL

Records of the early meetings of the Interstate Association of Livestock 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 Livestock Sanitary Association.

<table>
<thead>
<tr>
<th>Meetings</th>
<th>Date</th>
<th>Place</th>
<th>President</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept. 28-29, 1897</td>
<td>Fort Worth, Tex.</td>
<td>*</td>
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<tr>
<td>2</td>
<td>1898</td>
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<td>3</td>
<td>1899</td>
<td>Chicago, Ill.</td>
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<td>4</td>
<td>1900</td>
<td>Louisville, Ky.</td>
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<td>5</td>
<td>Oct. 8-9, 1901</td>
<td>Buffalo, N. Y.</td>
<td>E. P. Niles</td>
<td>F. T. Eisenman</td>
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<tr>
<td>7</td>
<td>Sept. 23, 1903</td>
<td>Denver, Colo.</td>
<td>W. E. Bolton</td>
<td>Hon. W. P. Smith</td>
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<td>8</td>
<td>Aug. 23-25, 1904</td>
<td>St. Louis, Mo.</td>
<td>J. C. Norton</td>
<td>Hon. W. P. Smith</td>
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<td>9</td>
<td>1905</td>
<td>Guthrie, Okla.</td>
<td>Hon. W. P. Smith</td>
<td>S. H. Ward</td>
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<td>11</td>
<td>Sept. 16-17, 1907</td>
<td>Richmond, Va.</td>
<td>D. F. Luckey</td>
<td>G. A. Jarman</td>
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<tr>
<td>14</td>
<td>Dec. 5-7, 1910</td>
<td>Chicago, Ill.</td>
<td>Chas. E. Cotton</td>
<td>J. J. Ferguson</td>
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<td>15</td>
<td>Dec. 6-8, 1911</td>
<td>Chicago, Ill.</td>
<td>John F. DeVine</td>
<td>J. J. Ferguson</td>
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<tr>
<td>16</td>
<td>Dec. 5-6, 1912</td>
<td>Chicago, Ill.</td>
<td>Masyck P. Ravenel</td>
<td>J. J. Ferguson</td>
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<td>17</td>
<td>Dec. 2-4, 1913</td>
<td>Chicago, Ill.</td>
<td>Peter F. Bahnsen</td>
<td>J. J. Ferguson</td>
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<td>18</td>
<td>Feb. 16-18, 1914</td>
<td>Chicago, Ill.</td>
<td>S. H. Ward</td>
<td>J. J. Ferguson</td>
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<td>20</td>
<td>Dec. 5-7, 1916</td>
<td>Chicago, Ill.</td>
<td>O. E. Dyson</td>
<td>J. J. Ferguson</td>
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<td>21</td>
<td>Dec. 2-4, 1917</td>
<td>Chicago, Ill.</td>
<td>J. G. Wills</td>
<td>S. H. Ward</td>
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<td>22</td>
<td>Dec. 2-4, 1918</td>
<td>Chicago, Ill.</td>
<td>M. Jacob</td>
<td>S. H. Ward</td>
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<tr>
<td>23</td>
<td>Dec. 1-2, 1919</td>
<td>Chicago, Ill.</td>
<td>G. W. Dunphy</td>
<td>D. M. Campbell</td>
</tr>
<tr>
<td>24</td>
<td>Nov. 29-30, Dec. 1, 1920</td>
<td>Chicago, Ill.</td>
<td>S. F. Musselman</td>
<td>D. M. Campbell</td>
</tr>
<tr>
<td>25</td>
<td>Nov. 28-30, 1921</td>
<td>Chicago, Ill.</td>
<td>W. F. Crewe</td>
<td>Theo. A. Burnett</td>
</tr>
<tr>
<td>26</td>
<td>Dec. 6-8, 1922</td>
<td>Chicago, Ill.</td>
<td>T. E. Munee</td>
<td>Theo. A. Burnett</td>
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<td>27</td>
<td>Dec. 5-7, 1923</td>
<td>Chicago, Ill.</td>
<td>W. J. Butler</td>
<td>O. E. Dyson</td>
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<tr>
<td>28</td>
<td>Dec. 3-5, 1924</td>
<td>Chicago, Ill.</td>
<td>J. G. Ferneyhough</td>
<td>O. E. Dyson</td>
</tr>
<tr>
<td>31</td>
<td>Nov. 30- Dec. 1-2, 1927</td>
<td>Chicago, Ill.</td>
<td>L. Van Es</td>
<td>O. E. Dyson</td>
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<td>32</td>
<td>Dec. 2-5, 1928</td>
<td>Chicago, Ill.</td>
<td>C. A. Cary</td>
<td>O. E. Dyson</td>
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<td>33</td>
<td>Dec. 4-6, 1929</td>
<td>Chicago, Ill.</td>
<td>Chas G. Lamb</td>
<td>O. E. Dyson</td>
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<tr>
<td>34</td>
<td>Dec. 3-5, 1930</td>
<td>Chicago, Ill.</td>
<td>A. E. Wight</td>
<td>O. E. Dyson</td>
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<tr>
<td>35</td>
<td>Dec. 2-4, 1931</td>
<td>Chicago, Ill.</td>
<td>J. W. Connaway</td>
<td>O. E. Dyson</td>
</tr>
</tbody>
</table>

*Information not available.
36 Nov. 30-
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-
43 Dec. 6-8, 1939 Chicago, Ill. J. L. Axby L. Enos Day
44 Dec. 4-6, 1940 Chicago, Ill. H. D. Port Mark Welsh
45 Dec. 3-5, 1941 Chicago, Ill. E. A. Crossman Mark Welsh
46 Dec. 2-4, 1942 Chicago, Ill. I. S. McAdory Mark Welsh
48 Dec. 6-8, 1944 Chicago, Ill. J. M. Sutton R. A. Hendershott
49 Dec. 5-7, 1945 Chicago, Ill. C. U. Duckworth R. A. Hendershott
50 Dec. 4-6, 1946 Chicago, Ill. William Moore R. A. Hendershott
51 Dec. 3-5, 1947 Chicago, Ill. Will. J. Miller R. A. Hendershott
53. Oct. 12-14 1949 Columbus, Ohio T. O. Brandenburg R. A. Hendershott
Dr. Brandenburg, Distinguished Members of this Association, and your Friends who are assembled here in Ohio: In behalf of the people of our State, I extend greetings and welcome to you. I hope that you are not anticipating that I will try to enter into a discussion of this very important subject of sanitation in the rearing and producing of livestock. I do not know enough about it except in one respect, and that is the ever-increasing demands that are being made upon the State Treasury to cope with brucellosis.

Those of you who come from other states, I hope that you are not plagued with that problem; Ohio is.

Having in mind that we are here discussing problems of the livestock farmer, may I relate to you my experience back in 1945 during that session of the legislature. We had two questions that were seriously dividing the members of the legislature. One was whether quail should be put on the hunting list. The second one was whether a hog known as the Ohio Improved Chester White should be, by legislation, pronounced as a separate breed.

The quail question was finally tabled, but the question of the Ohio Improved Chester White and the original Chester White was the one that was dividing the legislature. The legislature finally passed the bill and it came down to my desk for signature.

I had a number of letters on it. One irate farmer wrote. He said, "Mr. Governor, I protest vigorously against the signing of that bill. From time immemorial, and by common sense, it is known that new breeds are always created by new biological combinations and never by legislative declaration." (Laughter)

In respect to your meeting, I realize the seriousness of it and the importance and I do hope that you will pardon me if I indulge in a bit of lightness. You have experts here to discuss hog cholera and brucellosis and communicable diseases and parasitic diseases. I am not going to try to discuss those problems at all.

On the subject, I find myself in this position. I do not know, I admit I don't know, and on that basis, I am better than the man who doesn't know but thinks he knows.

You probably heard the story of the Jew and Frenchman who were on a boat together, on a tour. The Jew was at the table eating. He and the Frenchman were assigned to one table. The Frenchman came in and politely cracked his heels, bowed his head, and said, "Bon appetit."

The Jew got up and said, "Ginsberg." (Laughter)

At the next meal, the same thing happened. At the third meal, the same thing happened. The Jew finally concluded that there must be something wrong with what happened.

He went to the ship captain and said, "There is a Frenchman at my table. Every
time he comes up to the table, he clicks his heels and bows and says, 'Bon appetit'.
What does that mean?'

The captain said, "That means good appetite."

The Jew beat it to the dining room and on this occasion the Frenchman was at
the table and so the Jew bowed and clicked his heels and said, "Bon appetit."

The French man arose, bowed, and said, "Ginsberg." (Laughter)

Gentlemen, welcome to Ohio. I understand about forty states are already repre-
sented at this conclave or convention, whatever you might call it. We in Ohio
will be celebrating our 150th anniversary in 1953. The State was established and
admitted to the Union in 1803. Prior to that time, we had a territorial government
that grew out of the establishment of the Northwest Territory.

Today we are fourth in population, 37th in geographical size. I believe we are 5th
in industrial production, 6th in agriculture, and 7th in minerals.

We are proud of our State, but when I say that, I accompany that statement
with the remark that we are proud of every State in the Union, for the strength of
our entire Union depends on the strength of the individual states. To me, there
can be no improvement in any area or in any state of the United States without
bringing good to every other state in the Union. That which helps you in the North
Dakota eventually will help us in Ohio. That which aids us in this state, in some
manner or form when the total is made, will help other states in the country.

If we had any doubt about that, we do know this to be the fact, that in the hours
of trouble, regardless of the state from where we come, we have to stand by shoulder
to shoulder as Americans. When this last war was on, we here in Ohio learned about
troubles in Michigan or in California, or in Texas. We felt that those were our
troubles because that which hurts you there in your effort, hurt us in the combined
effort throughout the nation.

We in Ohio open our doors to you assembled here. We extend to you the clasp of
warm welcome, and we do that on the basis of being fellow Americans. That thought
today has greater significance, in my opinion, than it has had in the whole life of
our country. We have grown powerful. Our population is practically at the point
of 150,000,000. We have grown powerful in scientific research, powerful in our econ-
omy, powerful in our social relations, and the result is accompanying this big power,
there is a tremendous responsibility. Men and women that responsibility is so
grave that it requires the help and the effort of every American to successfully
carry it into effect. It would be folly for anyone to dismiss the thought that Stalin
does not intend to make one world out of the people if he can, and that will not be
a world of free people. It will be a group of tyrants and a world of slaves.

I read in this morning's paper about the terrific fear that has beset the Czech
people. 40,000 have been arrested, arrested because they do not believe in the
principles of their dictator. When I read that, I said to myself, "What would hap-
pen in American if the dictator entered upon our land? What would become of
Frank Lausche? What would become of Brandenburg, and yourself?"

If you gave expression to your religious belief and it was in discord with the
dictator, off would go your head. If you expressed thoughts of political freedom,
off would go your head. The responsibility is great. The effort needed to meet it is
tremendous. Let us stand together, fellow Americans, regardless of the states from which we come and fight to the last ditch the saboteurs within our midst and fight and fight so that there will be preserved for the world the great good that our republic has given to the world.

Good luck and best wishes to you. May there emerge out of this convention a program on sanitation in the care of livestock that will be of benefit to all of the people of the nation. Thank you.
RESPONSE TO ADDRESS OF WELCOME

By J. V. Knapp, State Veterinarian
Tallahassee, Florida

Mr. President, Your Excellency, Governor Lausche, good people of the City of Columbus and the great State of Ohio, it is a privilege and an honor to respond to the Address of Welcome and to say that the members of the U. S. Live Stock Sanitary Association are truly grateful for the sincere and cordial welcome extended us by your esteemed Governor.

We are happy indeed to bring our meeting to the State of Ohio and the City of Columbus.

The name Ohio, I have been told, is an Indian word and in the language of the Iroquois, means GREAT. I can easily understand that to the original inhabitants this was an appropriate term for the vast, pictorial and productive land they had fought for and made their home.

Truly the Creator was provident in placing immense stores of wealth in this great and fertile land, whose rolling hills and pleasant valleys beckoned to the pioneers in covered wagons, and then to later generations disclosed natural resources upon which they built an empire.

In gathering evidence to determine the greatness of states or nations, industrial development and production is far too often used as the standard of measurement, whereas, we all know that the life of man, as well as the existence of states and nations, depends on agriculture, and a healthy livestock industry is indispensible to an adequate and profitable agricultural economy.

Ohio has a splendid balance between agriculture, livestock and industry and it remains for her to maintain the health and energy of her livestock industry that the health and prosperity of her citizens be assured.

Doctor Geyer, State Veterinarian of Ohio, a very fine executive, is somewhat of a youngster in our group, and he would have you believe that the majority of the livestock in the United States, east of the Mississippi River, are in Ohio, and, with them, their attendant ills. This cannot be so unless these BUCKEYES I hear about since arriving in Columbus are a new or unusual specie of livestock not commonly produced in other parts of this country.

The production of livestock and poultry is one of the major industries of this country. It has tremendous ramifications which reach into the pocketbook and welfare of every citizen. It is the source of meat, milk, eggs and innumerable products and by-products which are essential to the health and well-being of the nation. Then the production, distribution and processing of its products furnishes the livelihood for a high percentage of the population and since livestock and poultry are the source of such a large part of the food supply, there are numerous disease problems, some of which are of great significance to public health, while others affect in greater or lesser degree our economic well-being.

When an animal fails to grow or produce, from any cause, the nation's meat or milk supply is endangered. When an infectious disease occurs in a herd or flock, it
is not alone the owner's misfortune—it is a menace to the community and its control a public responsibility.

This Association was organized over fifty years ago by representatives of the livestock industry and state and federal officials, for the purpose of seeking a means to prevent the losses resulting from the spread of infectious diseases. This Association has grown steadily in membership and achievement, and is now the recognized agency which, in cooperation with the U. S. Bureau of Animal Industry, formulates and develops national live stock disease control programs and strives to effect unity of state laws and regulations governing the conduct of such disease control programs and the movement of livestock from one state into another.

The membership of this Association is drawn from the Dominion of Canada, the United States and its Territories, and comprises not only state and federal regulatory officials, but the majority of the membership comes from the industry itself in all its various phases of production, handling, processing and distribution, and includes also research workers in livestock diseases, public health officials, representatives of transportation companies, agriculturalists, owners and editors of agricultural and livestock journals, representatives of the packing industry and the programs recommended by the Association have been the result of the combined thinking of this group—a meeting of the minds of the scientific research workers and the sound thinking and practical experience of men engaged in the production of livestock.

A long-winded speaker had been talking for over an hour, except for brief pauses from time to time to gulp a hasty drink of water. Finally, during one such intermission, an old farmer in the back of the room leaned toward his neighbor and announced in a loud whisper, "First time I ever saw a windmill run by water."

In bringing this meeting to Columbus, it is our earnest desire that the sessions of the meeting be attended by as many farmers and breeders of livestock from Ohio and nearby states as possible.

Governor Lausche, permit me to again express our thanks for your courteous greeting. I assure you that the warmth of your welcome is exceeded only by our desire to enjoy your hospitality.
PRESIDENT'S ADDRESS

T. O. BRANDENBURG

Bismark, North Dakota

It has been the custom of this organization for the Chairman to make an address, and I expect it is assumed that such address will contain, besides summaries of achievements of the livestock sanitary forces of this country, sound criticism and recommendations for more adequately carrying on this work.

After a war is over a great general may rest on his laurels and record of achievements, but our war against disease is a never-ending one, and the public which we serve is not interested in the meat, wool or leather of yesterday, but ask "What of today and tomorrow?"

Dr. Farquharson in his presidential address before the 83rd Annual A.V.M.A. Convention held in Boston said, and I quote:

"One of the weakest links in organized veterinary medicine is state veterinary service. Throughout the country it varies from good, to fair, to lackadaisical, to corrupt. In some states the objective and organization do not lend themselves to efficient and honest public service. These organizations are in the clutches of politically influential groups in which the office of state veterinarian is simply tolerated in name, and is utilized by ambitious groups for protection of their own selfish interests and ulterior motives. Political domination is often associated with inefficiency, extravagance, and waste of public funds."

"Frequently, the appointees of the sanitary boards consist of men who represent only one group of the livestock industry and ignore other interests. Often the state veterinarian is relegated to a subservient position by having policies imposed on him by a board that is neither intelligently informed nor qualified to pass on questions pertaining to animal disease control and public health. What I have to say is not applicable to all, but the conditions cited are present in many states. Some of the abuses and irregularities showing the futility of state veterinary service are well known and on record. The tenure of office of the average state veterinarian is insecure and is often dependent upon political whims. The appointee has frequently no special training in disease-control work. There is little or no incentive to outline an intelligent, practical, and progressive program. The inclination is to ride the wave and follow the dictates of the political supporters. On many occasions the office is abused in order to give free service for the benefit of the political few."

"In general the salaries of state veterinarians and their deputies are not commensurate with the responsibilities of the office and services rendered. The annual income from livestock and poultry in one rich agricultural state is approximately $500,000,000 which represents 72 per cent of the entire income from agriculture. Despite the fact that the chief reasons for losses to the livestock industry is disease, yet the statutes of the state in question provide that the salary of the state veterinarian, charged with control of animal diseases, be $3,600 per annum. In one of the largest livestock states in the Union the salary of the same official is $2,400. In still another the office of state veterinarian charged with control of animal diseases,
calls for a salary of $1,400. Such token salaries indicate the low esteem in which the office is held and do not promote competent and efficient veterinary service.”

“Much of the esteem held for the veterinary profession by the livestock industry, the general lay public, and the allied medical profession is undoubtedly due to the splendid record of achievement of the United States Bureau of Animal Industry. This organization has indeed been fortunate in having as leaders and key personnel so many men endowed with scientific ability, broad vision, and courage.”

“To maintain this high esteem it is essential that the Bureau shall continue to be both progressive and aggressive, and that the personnel shall be recruited from outstanding men in the veterinary profession.”

“This is no time for the Bureau to complacently look back and coast on its past achievements. We have as many problems confronting the veterinary profession today as at any time in our past history and we confidently expect the same aggressive leadership from the Bureau in solving these problems as has been given n the past.” Unquote.

This criticism of some state livestock sanitary departments seems severe, but judging by such investigation as I have made, I find that at least some of the statements of Dr. Farquharson were not overdrawn, but neither should his laudatory remarks about the B.A.I. indicate that they have all been free from criticism.

Chairmen of this organization have, in the past, been prone to extol the many accomplishments of the B.A.I. and veterinary sanitary officials as a whole, and we have all appreciated this very much. It has been sweet music to our ears, anesthetizing us to our many shortcomings.

Today I propose to ignore the progress we have made in the past, and point out as best I can my conception of the weaknesses of our whole livestock sanitary setup, with particular reference to the B.A.I. and its cooperative relationship with the various states which Dr. Farquharson passed over so lightly as far as any criticism was concerned, and out of this see if we can work out a new and better plan, in the hope that faster advances in the control of transmissible diseases of livestock can be made.

The Bureau of Animal Industry is, so far as I have been able to ascertain, the only Federal department cooperating with the various states that does not allocate money to the various state departments. The B.A.I. cooperates only by furnishing paid veterinary services cooperating under the laws and regulations of the states, but under the direction of a chief inspector employed by the Bureau.

This system is a survival of one set-up in the early days, and which was a necessity at that time due to there being no state set-ups in some states, or an inadequate one at best, often seriously blighted by politics.

Since that time many of the states have developed splendid livestock sanitary departments, headed by competent state veterinarians.

Experience now and in the past indicates that no enterprise can be successfully operated with more than one person in charge, and livestock sanitary work is no exception to this rule.

The present system is to blame for most of the discord found in so many states between the Bureau and the state departments, a discord which eats into every branch of the two departments and sometimes becomes so bad that the Bureau is
forced to change the Inspector in Charge, or the State Veterinarian, wearying of the struggle, may retire; or if he is less popular than the Inspector in Charge, may be retired without his consent in the interest of harmony.

The wastage due to this double headed system is appalling and takes its toll of our much needed top veterinary manpower as well as huge sums of money uselessly used up in maintaining two offices in every state with more or less duplicated records and work on all cooperating projects.

In most, if not all, states, livestock owners are completely confused by the present system as are many country agents and a few veterinarians. An owner may write to the State Department for a brucellosis test, or other request, in line with the two departments cooperating effort, and failing to get service in a week or ten days, writes the B.A.I. with the result that he often has a visit by a representative of both departments. County agents repeatedly resort to such tactics in an effort to get prompt action for their clients and the result is wastage, overlapping of work and irritation.

When both heads of these agencies cooperate fully much can be done to curtail these losses and errors; but if there is any jealousies or lack of cooperation, the results become increasingly worse depending on the amount of general animosity between the two department heads. The veterinarians and other help engaged by the two departments soon sense the prevailing animosity and scan the horizons for proper inflammatory material to feed the growing feud.

You all know the story better than I can tell it, and I am convinced, and I am not alone in this contention, that the system should be changed and soon; and I believe this group being made up, as we are, of all those affected, should make a careful study of this situation.

In 1935, during the meeting of the International Veterinary Congress in New York, while on the bus tour to the Walker Gordon Farms, I happened to share a seat with one of the German delegates. I do not recall his name, he could talk a little English, I understood a little German, and we tried to carry on a conversation. He wanted to know if I was on Herr Mohler’s force. I told him I was a State Veterinarian and tried to explain my duties. I am sure he didn’t understand. He could not see the use of having two heads in a state when one could do so much better unhampered by the other.

I tried to explain states rights and all that goes with it, but he couldn’t see what that had to do with disease control in livestock, and I couldn’t see either, but replied that that’s the way we have it here which stimulated him to say, “You Americans have too much money to spend, but Herr Mohler has done a wonderful job in spite of all these handicaps.”

My ideas may be unworkable under present conditions. I believe, however, that the B.A.I. should continue to cooperate with the various states in the major transmissible disease programs by a system of matching funds, all monies for livestock sanitary work, including state and federal, to be spent by the state and under its supervision but conditioned by certain signed agreements with the federal government, chief of which would be that all salaries paid out of such joint funds should not be lower than those prescribed by the B.A.I., and that all projects are to be carried out in cooperation with the B.A.I. and that all states should have live-
stock sanitary work supervised entirely by the state or entirely by the Bureau but not by both.

Some states, where veterinarians are scarce, may prefer to have all the work done by the Bureau and be willing to match money on projects on such a basis. The Bureau activities in the interstate movement of livestock should be extended and be their exclusive responsibility except in those cases where the state's regulations are more exacting than those of the Bureau's, in which case the additional regulation, in addition to those of the Bureau, should be under the control of the state.

Certain exceptions might have to be made relative to such important plagues as foot and mouth disease because of their extreme contagiousness and consequent national significance.

I request that this matter be placed for first consideration on the agenda of the Executive Board of this Association for discussion and possible action, and if they see fit the Chairman be requested to appoint a committee to give this subject careful study during the coming year and report to the Association next year.

I suggest that this Committee be made up of the best talent this Association has, and that not less than two members be from the B.A.I. and two be State Veterinarians of proven worth.

Under this proposed system the B.A.I. would review and pass on projects and claims for indemnity; all records of tests to be kept by the states but a monthly report made to the B.A.I. such as is now made to the Bureau each month by their unit in the states.

All field men now in the employ of the B.A.I., if they continue to work in the state they are now located, would be paid out of the joint fund above described and would be under the direction of the state.

Where the State agrees to turn over its livestock sanitary work to the Bureau, the Inspector in Charge would act as State Veterinarian for that State.

I am quite sure that such a system will in time raise the general level of efficiency of livestock sanitary work in all the states, assure better general salaries, better services, and reduce the ruinous effects of politics.

The relationship I am suggesting for the B.A.I. with the various states is not original by any means. In my own state I have seen it in operation by other federal agencies. The Bureau of Public Roads matches money with the state and millions of dollars are turned over annually to our Highway Department, and yet only a few years ago this money was withdrawn and the State Highway directed to get their house in order or else there would be no more federal aid. You can hardly imagine how quickly this was done. A competent head with adequate salary was forthcoming almost immediately.

Another state agency maintained partly by federal grant paid their head a salary a little over twice what most of the states' elective officers received. Naturally there was great jealousy and the legislature was determined to cut the salary of the head of this department, but when they learned that all federal money would be withdrawn if they did, the salary and the head of the department was left status quo.

Which brings us to the very definite conclusion that the B.A.I. could have the
power, under such a system, of strengthening the state departments in those states where they are not now what they should be, instead of from necessity undermining them still further and building the Bureau stronger in these weak spots. Such action on the part of the Bureau would take moral courage, but the whip they have could be very effective in getting results.

It will take courage to even attempt making a change of this kind, but something needs to be done if we are to realize our best efforts as veterinarians engaged in a common struggle against animal diseases. Such a system would, in my opinion, assure the B.A.I. of continuing their splendid record of leadership and achievement they have maintained from the beginning, and would give them the master role they should hold, of raising the general level of livestock sanitary work and the prestige of veterinarians everywhere.

In a B.A.I. release of February 25, 1949, to Presidents of State Veterinary Medical Associations, the following paragraphs occur; and I quote in part, as follows:

"We, along with many other members of our profession, have realized for many years that we must increase the volume of work if rapid progress is to be made in eradicating brucellosis. With about 25 million female dairy cattle over two years old, nearly 15 million similar beef cattle, and approximately 12 million heifers being raised each year, we know the testing of less than 6 million cattle and the vaccination of 3 million calves are not enough. Both the Bureau and the different state livestock sanitary officials have made every effort to recruit more veterinarians for this work, but the results have been far from encouraging."

"The cattle owners are rightfully looking to the Bureau, the state livestock sanitary officials, and the veterinary profession as a whole for leadership in eradication of brucellosis. As a group we must not fail them. As interested people have realized the gravity of the situation the use of lay help has been given more and more consideration. Thus the report of the Committee on Personnel of the brucellosis conference held in Chicago June 10 and 11, 1948, three of whose six members are veterinarians (one representing the American Veterinary Medical Association), contained the following statement:

"The use of lay personnel in areas lacking adequate veterinarians. Properly trained lay personnel, veterinary medical students, and other specially trained lay persons working under the supervision of veterinarians could relieve these men of many tasks and allow extension of the eradication program in areas now lacking sufficient professional coverage."

Also quoted is the following from the report of the American Farm Bureau Federation, Special Committee on Brucellosis, in approving the uniform program recommended by the United States Livestock Sanitary Association for the control and eradication of brucellosis.

"In states and areas where there is a scarcity of veterinarians, we urge training of lay personnel to supplement our veterinary forces in order to bring about a rapid and energetic program."

Veterinarians main objection to this seemingly radical departure from the customary procedure stems from the fact that they fear we will develop quackery and
take from the profession work which they will need should hard times come again.

It is our belief that we must look forward and not backward, and that the veterinarian of the future with his long period of training and preparation will not care to spend his entire life as a technician. Six years of veterinary training should fit men for greater tasks.

In any case, since it has now been thoroughly demonstrated that laymen can perform these duties adequately, we are faced with this question: Is the control of brucellosis or any other disease done for the benefit of the veterinary profession or for the livestock industry and for the general welfare of all the people?

Veterinarians are specially trained professional people, and disease control among animals is dependent upon their knowledge and service. Their future attainments will depend a great deal on how well they can develop the more difficult phases of their profession and how well they delegate the routine tasks to others.
REPORT OF THE SECRETARY

R. A. HENDERSHOTT

Trenton, New Jersey

This has been a very busy year for your secretary both from the standpoint of the volume of mail handled and also the number of meetings attended and conferences at which he represented your association.

In addition to the arrangement of material for the annual proceedings and the distribution of fifteen hundred copies, we this year published over 50,000 copies of the pamphlet entitled, "What Is Known About Brucellosis." The announcement in breed papers and over a number of farm radio broadcasts brought hundreds of inquiries relative to the availability of this popular pamphlet.

Anticipating continued interest in the pamphlet, we contracted to have plastic plates made of each page. This is a new process introduced into the printing business during the past year, which makes it relatively easy and less costly to make up prints for additional copies should they be needed. Present interest in the pamphlet indicates it shortly will be necessary to print a second run.

On November 30th and December 1, 1948, your secretary on request of President Brandenburg attended the conference of brucellosis research workers at the Morrison Hotel, Chicago. At this meeting reports were made on work being done on many phases of brucellosis studies by many of the outstanding workers throughout the nation. Almost without exception we have been privileged to hear all of these reporters on our annual programs over the past four years. The following committees were appointed to coordinate research:

1. Study of the Genus Brucella—Dr. C. M. Haring, Chairman
2. Diagnosis—Dr. Martin H. Roepke, Chairman
3. Natural Course of the Disease—Dr. S. H. McNutt
4. Immunology—Dr. C. A. Manthei
5. Public Health Aspects—Dr. Carl Larson
6. Therapy—Dr. Cornelia Cotton
7. Educational Policies—Dr. Roy E. Nichols

It is planned to hold annual meetings of this group. Dr. C. R. Donham was appointed general chairman of all committees.

On January 24–25, 1949 your secretary attended the Brucellosis Conference of the Northeastern States at New York City and delivered a talk on "The Part the Veterinary Practitioner Should Play in the Brucellosis Control Program" and served as a member of the Committee on Promotion of the Program. This meeting was well attended by extension workers—livestock owners and regulatory men. Several other members of your executive committee took an active part in this meeting notably Doctors I. G. Howe, C. P. Bishop, R. W. Smith and A. L. Brueckner.

On March 15th, Dr. B. T. Simms called a meeting in Washington, D. C. of all representatives of national organizations along with state and federal governmental regulatory officials. It was my privilege to talk on the advisability of a National

On April 29th, it was my privilege to represent the association and to take part in the conference on brucellosis of the Southern States at Memphis, Tennessee. This conference, quite similar to the one held earlier in New York, was well attended both by farmers and extension and regulatory men. It was my privilege to address this meeting on plans for a national program of brucellosis eradication in domestic animals, and later in the day to summarize the talks made during the opening day of the meeting, and to direct the discussion of the first day's program.

At this meeting, similar to others held previously, sub committees were appointed as follows:

2. Sub committee on laws, regulations and appropriations.
3. Sub committee on promotion on brucellosis program.
4. Sub committee on personnel.
5. Sub committee of producers and breeders.
6. Sub committee on state and county organizations.

It was my privilege to serve on the sub committee on promotion of brucellosis program.

At all these regional meetings, it was interesting to note that those in attendance dedicated themselves and advocated that there be no tolerance with brucellosis in livestock but that the disease control program be set up to accomplish complete eradication of brucellosis from the livestock population of the nation. The reports of these various conferences are available through the Department of Agriculture, Bureau of Animal Industry.

On September 14th, your secretary was requested by Dr. A. K. Kuttler to come to Washington to participate in the recording of talks on brucellosis eradication. These I understand are to be reproduced on platters and distributed to the farm radio programs across the nation.

On September 22nd and 23rd, it was my privilege to attend the meeting of the
symposium on brucellosis conducted by the National Institute of Health and Public
Health Services at Bethesda, Maryland. Both the human and veterinary side of
brucellosis as well as some of the technical laboratory work being done in con-
nection with brucellosis was discussed by such people as Alice Evans, Drs. Manthei,
Hutchings, Boyd, Simms, Spink, McCullough, Jorden, Newton and Meyer. This
was one of the most instructive and interesting meetings on brucellosis held
during the year. A monograph will be published on all papers presented by the
Institute of Health and should be ready for distribution in about six weeks. It is
my understanding that the monograph will sell at about $3.00 each.
MEMORIAL SERVICE

J. L. Axby

Indianapolis, Indiana

Mr. President, Members of the Association, Ladies, and Gentlemen: The following members of our Association have passed away during the past fiscal year:

Dr. W. J. Butler, 67, Helena, Montana, died October 31, 1948 after a long period of failing health.

Doctor Butler had led an eventful life. Born in Scotland, he came to the United States at the age of seven, grew up in Brooklyn and was graduated from the New York-American Veterinary College in 1903. He entered B. A. I. service immediately and was sent to Montana to investigate the diseases of range cattle. In the following year he began practice in the state, but in 1910 gave up practice for mining in Mexico, from which he was called back to Montana in 1913 to accept the office of State Veterinary Surgeon. In this position he served with conspicuous success for 35 years, having retired only a few months ago.

The office of State Veterinary Surgeon in Montana is vested with great responsibilities. The occupant is a member of the State Board of Health, State Board of Entomology, and Director of Laboratories of the State Livestock Sanitary Board. He has full charge of milk inspection in all cities in the state, is president of the Stallion Registry Board and a director of the State Fair Board.

Doctor Butler's administration of disease control and eradication (dourine, glanders, rabies, cattle mange, sheep scabies and bovine tuberculosis) in Montana was a model for other livestock sanitary authorities to employ. He had the complete and unwavering confidence of the livestock raisers of his state for a whole generation.

The Montana Livestock Sanitary Board, of which Doctor Butler was executive officer, was the first such board to officially adopt the intradermal tuberculin test; it was the first to adopt the 60-day retest of herds from which tuberculous animals had been removed and Montana was the first state to require the tuberculin test of all dairy cattle irrespective of whether or not milk from the herd was offered for sale.

Doctor Butler was president of the Montana Veterinary Medical Association 1938-1939, and of the U.S. Livestock Sanitary Association 1922-1923 and served with distinction on all of its important committees during the past thirty years. In 1938 he attended the 13th International Veterinary Congress of Zurich, Switzerland as an official representative of the USDA, and in 1947 he was awarded the 12th International Veterinary Congress prize. In World War I he served in the field artillery.

George Alexander Dick, aged 70, Emeritus Professor of Animal Husbandry and former dean of the School of Veterinary Medicine, University of Pennsylvania, died in University Hospital, Philadelphia, on October 15, 1948. He received his veterinary degree from the University of Pennsylvania in 1904 and the degree of Bachelor of Science in Animal Husbandry from Iowa State College in 1919. From 1904 until 1916, he was engaged in general practice at Kane, Pa., and during this time became interested in the breeding of Ayrshire cattle. In 1917, Dr. Dick re-
turned to the University of Pennsylvania as assistant professor of animal husbandry. Three years later he was made full professor and, in 1931, he was appointed dean, following the resignation of Dr. Louis A. Klein. In February, 1946, Dr. Dick resigned as dean, to devote his entire time to teaching and research work. In June of this year, he retired from active service.

WALTER B. VAN CLEAVE (Ind. '09), 63, Peoria, Illinois, died on February 19, 1949. Dr. Van Cleave had been county veterinarian for twenty-five years and had contributed much time and energy to the tuberculosis and brucellosis eradication programs. A charter member of the newly formed Illinois Valley Veterinary Medical Association, Dr. Van Cleave was also a member of the Illinois State VMA, the Mississippi Valley VMA, The A.V.M.A. and the U. S. Livestock Sanitary Association.

WILLIAM M. LONG (Corn '16), 56, Baldwinsville, New York, died on February 22, 1949. Dr. Long was admitted to the AVMA in 1923 and was a member of long standing of the United States Livestock Sanitary Association.

ARTHUR JAMES GLOVER (Minn '99), 76, Fort Atkinson, Wisconsin, died on May 8, 1949. Retired editor of Hoard's Dairyman and honorary member of the AVMA since 1920, Mr. Glover was a celebrated educator and organizer in the livestock field. He was honored for backing national bovine tuberculosis eradication when opinion on that subject was by no means unanimous in the agricultural press. He opposed the Russell plan of turning tuberculin testing over to laymen. He was a relentless critic of incompetent veterinarians and a booster for the capable, but was honored by the veterinary profession mostly for holding out wholesome milk as a means of promoting the interests of the dairy farmers. Mr. Glover took an active part in the United States Livestock Sanitary Association having served for a number of years on the Committee on Tuberculosis and also on the Committee on Brucellosis. He will long be remembered for his clear logical reasoning and for his support of measures that he knew would benefit the livestock industry.

PHILIP L. GAUNT, 40, Trenton, New Jersey, died on September 3, 1949, after a long illness. He had practiced veterinary medicine in Trenton for the last five years. A graduate of the University of Pennsylvania, he served as a captain in the Army Veterinary Corps in World War II. Though young, both in his profession and our Association, he was a staunch supporter of livestock disease control and eradication programs; a credit to his profession and friend of the livestock owner.

May I respectfully request all present to arise and remain standing for a short period of silent prayer for the peaceful repose of the souls of these departed members.

Silent prayer.

Thank you.

Again we are humbly trying to continue the custom of honoring the memory of these men, knowing that "memory is the only friend that grief can call its own", and we conduct this memorial service because these men were possessed of constructive thinking which enabled them to overcome failure and discouragement and open the way to a fuller, richer life.

Their lives show they knew how to apply the supreme law of God's omnipotent power, based on eternal truths, to their lives and daily living.
They believed in a universal harmony in diversity, that is, each group and nation working towards the sum total of civilization according to the dictates of its own conscience, character, genius, and God-given talents.

They believed in brotherhood; yes, they believed in everything that, when co-joined, makes life on earth more beautiful and wholesome for all people.

In their passing away, the Association has lost the many helpful services performed by them, but their respective communities will not have lost the inspirational aid for which they were so well known and so widely appreciated, all of which clearly demonstrates the virtues and benefits of Christian Faith.

For, after all, but surely, when we come to that boundary—that impassable gulf or canyon, call it what you may—where you can go no farther by inquiry or research, there and then, what is the distant, unknown land, becomes a question exclusively of faith, and we shall choose as our faith, as did those we memorialize today, that which is the most beautiful, the most charming, and that which will promote man's happiness to the greatest extent and add to the glory and honor of the Great Author of all things.
REPORT ON BRUCELLOSIS ERADICATION PROJECT

BY A. K. KUTTLER, D.V.M.¹

Statistical data on the Brucellosis Eradication Project have been prepared as usual. These reports are available here, and additional copies may be secured by writing the Bureau office in Washington. You will note there was an increase in the number of cattle tested for brucellosis during the last fiscal year of 236,555, or a little more than 4 per cent over the number of cattle tested the previous fiscal year. The increase in the number of calves officially vaccinated was 413,801, or an increase of more than 35 per cent. Due to changes in the program in many of the states, and shortage of veterinary personnel, it has been necessary to remove a rather large number of counties from the accredited list.

During the past year, several of the states have taken steps to eliminate indemnity payments for animals which react to the test for brucellosis, and propose to utilize funds formerly used for indemnity payments to increase calf vaccination. There are now 16 states which have no provision for indemnity payments, or have arranged to discontinue such payments.

REGIONAL AND NATIONAL BRUCELLOSIS MEETINGS HELD

District brucellosis meetings have now been held by Bureau and Extension Service representatives of the Washington office, in all of the districts except the Western States. Each district is comprised of approximately 12 states. Prominent livestock producers, representatives of the United State Livestock Sanitary Association, American Veterinary Medical Association, the Farm Press, Extension Service, American Farm Bureau Federation, public health officials, practicing veterinarians, state livestock sanitary officials, and other interested groups were represented in each of these meetings. The recommendations for brucellosis eradication in domestic animals, made by this Association and approved by the Bureau, served as the basis for discussion at each of these regional meetings, and were endorsed at each of them. This statement should not be construed to indicate that everyone was happy. Some rather heated discussions took place; however, in the end, a very large majority of those in attendance agreed that brucellosis eradication should be the objective, and that these recommendations should be accepted by all in the interest of bringing more order to the project.

In addition to these district meetings, research groups from state experiment stations and other groups conducting research on the brucellosis problem met in Chicago November 30–December 1, 1948. It has been stated by those who have attended such meetings in the past that there was greater accord at this meeting of research workers than at any previous meeting on brucellosis. A 169-page report of the meeting, compiled by the Pathological Division of the Bureau, brings us up to date on brucellosis research.

¹ Dr. Kuttler is In Charge of the Tuberculosis Eradication Division, Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.
The Subcommittee on Public Health Aspects of Brucellosis, of the National Research Council, with Dr. W. W. Spink, of the University of Minnesota, at St. Paul, Minn., as Chairman, has approved the recommendations of the U. S. Livestock Sanitary Association. This report will be available in the near future.

On September 22 and 23, 1949, a symposium on brucellosis was held under the joint auspices of the National Institutes of Health, Public Health Service, the Bureau of Animal Industry, and the National Research Council. Outstanding research workers in the field of medicine and veterinary medicine presented papers and participated in the discussions. Proceedings of this meeting will be available in about five months, as a monograph, published by the American Association for the Advancement of Science, 1515 Massachusetts Ave., N. W., Washington 5, D. C.

In compliance with the recommendations of a committee which met in Chicago June 11, 1948, Dr. B. T. Simms, Chief of the Bureau of Animal Industry, requested that representatives of all organizations interested in the brucellosis problem on a national level hold a meeting for the purpose of setting up a National Brucellosis Committee. This meeting was held March 15, 1949, in Washington, D. C., and another meeting of this group was held in Chicago, Ill., on May 10. Permanent policies of the group were discussed, and a chairman and secretary were appointed, who in turn appointed six subcommittees, the chairmen of which will serve on the Executive Committee. Arrangements were made for a meeting of this committee here in Columbus, Ohio, for October 11. It is hoped that a permanent paid secretary and office staff may be established in order that the committee might give its active support to the brucellosis eradication project.

**THE MILK RING TEST**

Further study of the “A.B.R.” or Milk Ring Test, during the year has resulted in some encouragement. It may be possible to use this test in locating brucella-infected herds in areas where most of the cattle are of the dairy type. Should further research prove this test to be sufficiently accurate, it will aid greatly in solving the manpower problem and at the same time reduce considerably the cost of making surveys in areas where dairy cattle predominate.

**PUBLICATION OF THE PAMPHLET, “WHAT IS KNOWN ABOUT BRUCELLOSIS”**

The pamphlet, “What is Known About Brucellosis,” which was requested by the Brucellosis Committee of the U. S. Livestock Sanitary Association at the December 1947 meeting, was prepared by a committee selected by Dr. Simms and Dr. J. V. Knapp, the President of the U. S. Livestock Sanitary Association, and since its publication by the Association has, as you know, been very widely distributed. Some states have purchased as many as 10,000 copies of this pamphlet. The Bureau distributed about that number, and has received many reports on the pamphlet, all of which have been very complimentary. This pamphlet is available through the secretary of your association.

Notwithstanding the marked progress that has been made toward the objective of more factual information being disseminated on brucellosis, there still appears in the press from time to time some very confusing statements concerning this disease. It is hoped that, with the distribution of the reports which have been prepared fol-
Following the district meetings and other meetings referred to, and the widespread distribution of the pamphlet, "What is Known About Brucellosis," that further progress has been made in correcting this situation.

RECOMMENDATIONS OF THE U. S. LIVESTOCK SANITARY ASSOCIATION

Livestock sanitary officials of 43 of the states have agreed to work toward the uniform objective as outlined in the reports of the 51st and 52nd Annual Meetings of the U. S. Livestock Sanitary Association for brucellosis eradication in domestic animals, which have been approved by the Bureau.

I am aware of the fact that this is a rather short report; however, if you will read the reports of the various groups referred to, you will observe that greater unity has been attained than for any like period since the brucellosis eradication project was undertaken 15 years ago.

SUMMARY

While there are still some points in the recommendations of the U. S. Livestock Sanitary Association which have not been fully agreed upon by all groups, a large majority in all of the district and nation-wide meetings referred to in this report voted in favor of acceptance of the recommendations of the Association, and all were agreed on the proposition that the objective should be brucellosis eradication in domestic animals, which is the only likely source of the disease in man. Therefore, there is justification for the conclusion that our objective should be to proceed in line with these recommendations, now that all groups have discussed the proposed procedures, and in the main have reached agreement.

Livestock sanitary officials of 43 of the states have agreed to work toward the uniform objective as outlined in the reports of the 51st and 52nd Annual Meetings of the U. S. Livestock Sanitary Association for brucellosis eradication in domestic animals, which have been approved by the Bureau.

If the accord reached in all other brucellosis meetings can be attained in the National Brucellosis Committee, the formation of this group may well be the most important step taken during the past year in connection with the brucellosis problem.
Brucellosis is the subject which I have been asked to discuss here today, and to put before you my experiences in the control of this disease in our herd. But before I enter into this subject, I would like to discuss briefly some of the problems entering into the production of livestock in our country.

The raising and breeding of cattle is a long drawn out affair and requires much thought and foresight. The success in running a commercial or purebred herd depends largely upon the management and foresight given to it. Naturally a good operator strives to have top quality cattle and a high calving percentage, and endeavors to get the best economical growth on the young animals as well as to keep the herd free of contagious diseases.

The production of livestock is a business of its own. It must be handled and controlled like any other business if it is to be profitable. The operator, or manager as the case may be, is confronted with many and varied obstacles, which must be met and overcome if the undertaking is to be a success.

The raising of livestock is very similar in many ways to other lines of agricultural production, in that the farmer and livestock grower both try to get the greatest possible yield per acre from ground growing a crop that is suitable, as well as profitable, to that particular area. In so managing these acres it is always the desire of the producer to harvest a crop that is high in quality as well as quantity, and that the product be one that the consuming public is demanding at all times. With a top quality product the operator has a better chance of making more net dollars per acre of land involved.

We have, in these United States, a vast acreage of land that is of a type that can not be cultivated because of its terrain being rough, rocky, brushy or timbered. However, this same land does produce crops of various kinds of grasses that can only be harvested by livestock of some kind.

There are many different kinds of processing plants, all preparing the raw product for human consumption. Livestock can well be classed with other processing plants. Imagine, if you can, acres of waving grasses, grain fields and hay meadows being processed through the growing of livestock to eventually become choice steaks, prime roasts, lamb chops or leg of lamb. Big game could also be included for its production of deer and elk steaks.

Therefore, livestock production should take its rightful place in the economics of these United States as a vast processing plant for the millions of acres of grass lands, which otherwise would be non-productive with no means of paying taxes, nor any source of income to the owner.

The raising of livestock is a big undertaking. They must be looked after the year around. Feed must be produced during the summer months to carry them through the winter or else they may perish. The enormous loss of cattle and sheep in the
western country during the winter just past is an example of the need of being pre-
pared with ample feed for stock.

Raising cattle is different from raising vegetables, grain and other lines of agricul-
tural products, for after starting the process of production, in less than six months,
in many cases, the crop is harvested and sold. The production of cattle is much dif-
ferent. As a role the choice steaks and prime roasts of beef come from a steer weigh-
ing upwards of 1000 pounds and a steer of this average weight, or better, will neces-
sarily be around two years of age. To produce the choice cuts of beef requires from
30 to 36 months before the producer really cashes in on his crop, as compared with
the average 6 months period for many agricultural pursuits.

My mind has always run along the line of improving the quality of livestock.
This is one of the most interesting and fascinating things that enters into the breed-
ing of cattle. This is one of the reasons we cattlemen like to continue in the cattle
business—“For once a cattlemen, always a cattlemen”. Many breeders in order to
save a little cash outlay, buy the poorer grade bulls at a low price. This may turn
out to be an expensive investment. The low grade bull too often proves to be an un-
satisfactory breeder which can not be determined for at least two years. The damage
to the herd can be twofold. First, a crop of poor grade calves; second, the loss of
time in building up the quality of the stock. Therefore, careful thought and study
must be given the proper selection of herd sires that will mate with the cow herd in
order to produce a high quality offspring. A good quality animal eats no more than
a low grade one; the better quality animal takes on a quicker and better finish; de-
mands a better price; and in turn yields a larger net profit per acre of land involved.

The feeding season in our country begins around December 15th and ends about
April 10th. It is during this period that we have the best control of the cattle, much
better than when they are in large pastures or on the open range. The older cows are
fed in open fields, but the younger cows and the heifers are fed from racks, in order
to favor them with better care and extra feed. All feed racks are kept clean, with lit-
ter and mused over or wasted hay cleaned out and hauled away. We endeavor to
change the feed grounds as often as is practical, moving the cows from one field to
another. These practices are carried out in an effort toward better sanitation. Suffi-
cient balanced feeds; plenty of good water; shelters of some sort or windbreaks all
help to keep cattle in good thrifty condition. This means much in warding off dis-
eases as well as to better develop the young stock.

The disease problem in cattle has been gradually increasing. Brucellosis, blackleg,
anthrax and foot and mouth diseases have been a menace to the cattle industry for
some time. Brucellosis and blackleg, two of the more destructive diseases, are now
controlled if properly handled. Some of the more recent diseases such as red water,
water belly, x-disease, anaplasmosis and some form of calf scours are still a problem.

Brucellosis, one of the older diseases, has been a bad one to combat but seems now
to be well on the way to being controlled or prevented, even though some of the doctors of veterinary medicine do not agree on the method of control.

I have been quite active and much interested in the raising of both sheep and
cattle since I was quite a small boy and have experienced many ups and downs as
well as many of the problems that have confronted the livestock industry in over half
a century.
My first experience with livestock diseases was liver flukes in sheep. That was about 50 years ago and our losses were heavy. This caused us quite a set back in the sheep business until we found out the source of this trouble and were, therefore, able to prevent it. In later years we also had foot rot in sheep. This was likewise very troublesome but could be kept down. Scabies was very prevalent at one time but timely treatments kept it checked, but we were never able to do very much with the hungry sheep. Blackleg in cattle caused considerable loss for years but is now successfully prevented by vaccination.

As previously mentioned, in order to be successful in the production of a commercial herd of cattle the producer should have top quality stock, use top quality bulls, provide ample feed to be assured of a good growth in the young animals, strive for a high calf percentage and keep the herd free from diseases. Cattle kept in a good vigorous condition are not so apt to contract diseases as are the poorly fed stock.

Back in the year 1935 we were running about 1350 head of commercial cows, keeping our calves till they were two years old. In those days it was a very common thing for us to lose from 10% to 15% of our expected calf crop each year from brucellosis. This disease has been the most costly to us of any of the other livestock diseases with which we have had to contend, and is still a menace to livestock operators throughout the country. The aborted calf was not the only loss encountered. The services of an expensive bull were wasted and with the disease prevalent in the herd there was a tendency for the milk supply to be reduced in the infected cows. A good supply of milk is of much importance in the development of the calves in a range or commercial herd. The overhead in caring for and feeding for a year, this infected cow that lost her calf, was entirely wasted, and the cow was eventually slaughtered. Also, the animal lost was many times one of the top grade cows in the herd. That was a loss in money and time, that had gone to build up a high quality animal.

With these problems confronting us in the cow business we vigorously set out to overcome this disease as rapidly and completely as was humanly possible. We started with the testing and slaughter program and carried on with it for a period of five years. The first year of our testing program our cows were tested five times, resulting in a loss of reactors to the disease of 18% of the breeding herd. The following four years we tested from two to three times each year. Each test gave a smaller percentage of reactors and suspects, until in our last test we had only one reactor and one suspect. During this period if any cow showed signs of the possibility of losing her calf she was immediately isolated from the herd, and this practise is still continued. All tested cows that reacted were isolated at once until such time as they could be slaughtered.

One of the most likely places for brucellosis to be spread is on a continuously used feed lot where the hay is spread on the ground and the cows tramp back and forth over the feed. This contamination prompted us to change our method of feeding by building feed racks. We used them as much as possible, and in cases where it was not practical to have feed racks, we changed the feed grounds often.

To some of the large operators this repeated testing may seem unprofitable on account of handling the cattle so much. However, with handy corrals and chutes it is not so bad. We developed a method of branding the cattle the first time they were
tested in order to eliminate putting them through the chute again to check ear tags when locating reactors. This method was very important as it reduced handling and made the program more effective. This system of branding has also given us an accurate age record of every cow in the herd and we still continue its use. I will be glad to explain this branding system to anyone interested. The testing and slaughter program involved a great deal of work, and it was very difficult to maintain a clean herd as the range cattle mixed with other herds not tested.

In the fourth year of our testing program, calf vaccination came into the picture. We took this up and have continued the practice since that time. This vaccination of the calf seemed to solve the problem of keeping the herd clean. In order to convince ourselves that calf vaccination was effective we Bang tested the first 200 heifers vaccinated after each had produced a normal calf and were about thirty months old. In this trial test we had one suspect. In the calfhood vaccination program for brucellosis we have always been very particular to get the calves vaccinated between the ages of four and eight months and have also been careful about bringing infected animals into the herd. We have been reaping the harvest of cleaning up the herd from brucellosis for the past several years. The loss from brucellosis in our cows at the present time is nil. Our calving percentage has increased from approximately 80% to 96%, with 85% of the calf crop dropped the first sixty days of the calving season, which begins about February 18th. Our methods and practices in the control and prevention of brucellosis in our outfit has worked out in quite a satisfactory manner and we are very happy over the results obtained.

Brucellosis is a major problem facing the livestock industry and must be controlled if the operator is to make a profit in his business, and it can be controlled under proper management.

To summarize the methods of control we used in freeing our herd of brucellosis: the disease in the adult animal was reduced to a minimum by testing and slaughter; calf vaccination was instituted in the replacement heifers; conscientious observation of sanitary methods, especially in the isolation of any reactors or suspected animals where a cow showed signs of abortion; the destruction of all aborted calves; the strict rule that any animals added to the herd must be tested and negative or vaccinated. Ample feed of good quality goes far in the prevention of brucellosis as well as any other diseases.
FIELD EXPERIENCES WITH BRUCELLA M VACCINE

B. J. Killham, G. W. Reed and C. F. Clark

Lansing, Michigan

This was not, in the true sense, a research project. The research had been accomplished by Dr. I. F. Huddleson and his associates. There was an effort, however, to determine the brucellosis status of average farm herds before and after vaccination with Brucella M vaccine. Also, data covering tests of the infected herds in one area test county were obtained for comparison. The Brucella M vaccine was not available for general use until November 1947. Obviously, the time elapsed has not yet been sufficient to permit a complete survey.

Three groups of herds were studied. Two of the groups were in counties where area brucellosis testing was under way and the third group was located in a county where no area testing had yet been attempted. The third group was selected because of the presence of a veterinarian who is a good record keeper and an excellent cooperator.

The herds for study were selected without knowledge of their previous brucellosis history or information regarding developments after vaccination. The State Department of Agriculture furnished a list of the cattle vaccinated with Brucella M in the three areas involved. The Brucella M vaccine, in each instance, was applied by the local veterinarian at the request and expense of the herd owner.

The test data for the area test counties were obtained from the state and federal records. With the consent of the local veterinarian mentioned, the herds in the third group were visited and tests conducted.

Brucella M vaccination records were obtained for 159 herds containing 3,395 cattle. The records of 42 herds containing 993 cattle were rejected because of inaccurate or insufficient data, strain 19 vaccinations or other factors. Hence, this report covers 117 herds containing 2,402 cattle. Figures were based on the average number of cattle in the herds during the periods covered. Reactors, if retested, were not considered. The regulations require that herds to be vaccinated with Brucella M must be tested within 30 days preceding the vaccination. Hence, the dates of vaccinations and prevaccination tests coincided closely in most instances. If more than one prevaccination test was conducted, the reactors and suspects were not counted more than once.

GROUP NO. 1

These herds were in a county undergoing area brucellosis tests according to the deferred slaughter plan. The tests were conducted by official veterinarians. Later, if desired, calves were given Strain 19 vaccine without charge to the cattle owners. At the time of the survey the Strain 19 vaccinates were not old enough to influence the disease trend in the herds involved. But, the Strain 19 vaccinations undoubtedly were responsible for many of the reactors and suspects later found among the younger cattle. In checking test records young cattle, which obviously were showing titres because of Strain 19 vaccination, were considered as negative animals.
The interval between vaccinations and the last postvaccination tests varied from 3 to 16 months—average 9 months.

Because of the varied and possibly long period of incubation for brucellosis, it should be remembered that many of the vaccinated cattle in the infected herds had been exposed and were in the incubative stage at the time of vaccination. In many instances such animals would show titres later regardless of vaccination. There is no contention that Brucella M is a cure for brucellosis. Its scope is confined to the field of prevention. Reactors and suspects found after vaccination, particularly on the first tests after vaccination, in many instances were not due to the failure of the Brucella M vaccine. Reactors and suspects of this kind, although indicated in post-vaccination reports, could, and in many instances, should be charged to prevaccination infection.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Reactors</th>
<th>Percent</th>
<th>Suspects</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Pre-vaccination Tests</td>
<td>172</td>
<td>20.07</td>
<td>101</td>
<td>11.8</td>
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<tr>
<td>Post vaccination Tests</td>
<td>31</td>
<td>3.62</td>
<td>21</td>
<td>2.45</td>
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Table 2

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<th>Percent</th>
<th>Suspects</th>
<th>Percent</th>
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</thead>
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<tr>
<td>Pre-vaccination Tests</td>
<td>123</td>
<td>16.9</td>
<td>92</td>
<td>12.62</td>
</tr>
<tr>
<td>Post vaccination Tests</td>
<td>30</td>
<td>4.11</td>
<td>32</td>
<td>4.39</td>
</tr>
</tbody>
</table>

Group No. 2

Herds in this group were located in a county engaged in an area test with the slaughter of reactors delayed. There was some calfhood vaccination. The situation and developments were much the same as for Group No. 1.

The interval between vaccinations and the last postvaccination tests were from 5 to 16 months—average 11 months.

Group No. 3

This was the group located in the county in which no area testing was under way. The herds were rather widely scattered. All of the owners of these herds were visited and the herds were retested. In all instances but one the results of the vaccinations were entirely satisfactory. Abortions apparently were no longer a problem.

The intervals between vaccinations and the last postvaccination tests were 3 to 17 months—average 9 months.

Under the condition which prevailed during this survey, control cattle were prac-
BRUCELLA M VACCINE

Tically out of the question. A search was made for a worthwhile means of comparison and finally a record of the initial and subsequent tests of the infected herds in one of the area test counties was secured. The deferred slaughter plan was in effect in the county but cattle owners were encouraged to sell the reactors and many did.

**Table 3**
36 Herds—816 Cattle
30 Herds Infected

<table>
<thead>
<tr>
<th></th>
<th>Reactors</th>
<th>Percent</th>
<th>Suspects</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Pre-vaccination Tests</td>
<td>103</td>
<td>12.6</td>
<td>91</td>
<td>11.15</td>
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<tr>
<td>Post vaccination Tests</td>
<td>25</td>
<td>3.06</td>
<td>54</td>
<td>6.62</td>
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**Table 4**

<table>
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<th>Reactors</th>
<th>Percent</th>
<th>Suspects</th>
<th>Percent</th>
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<tr>
<td>Initial Tests</td>
<td>308</td>
<td>13.59</td>
<td>293</td>
<td>10.01</td>
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<tr>
<td>1st and 2nd Retests</td>
<td>207</td>
<td>7.07</td>
<td>304</td>
<td>10.39</td>
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**Table 5**

<table>
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<tr>
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<th>COMPARISON GROUP</th>
<th>COMPOSITE OF GROUPS VACCINATED</th>
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<tr>
<td></td>
<td>HERDS 311—CATTLE 2,927</td>
<td>HERDS 117—CATTLE 2,402</td>
</tr>
<tr>
<td>Initial Tests</td>
<td>Reactors</td>
<td>Suspects</td>
</tr>
<tr>
<td>Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactors</td>
<td>13.59</td>
<td>10.01</td>
</tr>
<tr>
<td>Suspects</td>
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**Table 6**

<table>
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<tr>
<th></th>
<th>Initial Tests</th>
<th>Subsequent Tests</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Reactors</td>
<td>Suspects</td>
</tr>
<tr>
<td>Comparison Group</td>
<td>13.59</td>
<td>10.01</td>
</tr>
<tr>
<td>Vaccinated Groups</td>
<td>16.52</td>
<td>11.86</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The conditions in these herds could be fairly compared with the conditions in the herds in groups 1, 2 and 3.
The 311 herds in the comparison group contained 2,927 cattle at the time of the initial tests. The herds were all infected to some degree. The findings are depicted in table 4.

Intervals from initial tests to second retests 3–15 months—average 7 months.

A comparison of the findings in the three vaccinated groups and the comparison group is present in table 5.
The shorter average interval of observation—7 months—for the comparison group should favor that group in making contrasts. The testing done over another period of two months would add more reactors and suspects to those indicated for the retests.

The intervals for observation of vaccinated herds have been entirely too short. More time is needed. Control animals are desirable for comparisons but under average conditions it is practically impossible to secure such animals.

SUMMARY

In studying the results of the use of Brucella M vaccine it was decided to compare vaccinated groups of cattle with groups which had not been vaccinated. Control animals not being available the incidence of infection in the initial and subsequent tests was used as a basis for comparison. The situations in the vaccinated and unvaccinated groups were reasonably comparable. The vaccinated groups contained 117 herds and 2,402 cattle. The comparison group was made up of 311 herds containing 2,927 cattle.

The initial tests in the comparison group showed 23.6 percent reactors and suspects (13.59 percent reactors and 10.1 percent suspects). The first tests of the vaccinated groups revealed 28.38 percent reactors and suspects (16.52 percent reactors and 11.86 percent suspects. The subsequent tests, which included the first and second retests for the comparison group and the tests after vaccination for the vaccinated groups, indicated for the comparison group 17.46 percent reactors and suspects (7.07 reactors and 10.39 suspects) and for the vaccinated group 8.09 percent reactors and suspects (3.60 percent reactors and 4.49 percent suspects). The lowered incidence of infection, or possible infection, was in favor of the vaccinated group as indicated by the difference in the subsequent findings. This occurred despite a slightly higher initial infection in the vaccinated groups.

The final comparison is presented in the following table:

A casual glance at the percentage differences in favor of the vaccinated groups as indicated for the subsequent tests—3.47 percent reactors and 5.90 percent suspects—may not reveal anything impressive. Actually, however, the reduction in reactors and suspects attributable to the vaccination is just about 50 percent.

A few problem herds were encountered in each group. These have been included in the report. The plan is to report on these herds separately at a later date.

Note: Dr. C. H. Hays, Federal Inspector in Charge, furnished the data pertaining to the group of herds used for comparison. His help is gratefully acknowledged.
OBSERVATIONS ON THE USE OF BRUCELLA (M) VACCINE

C. F. CLARK

Michigan State College, East Lansing

AND LETHA PHELPS

Michigan Department of Agriculture

Dr. I. F. Huddleson, Brucella Laboratory, Michigan State College, East Lansing, Michigan has previously reported on the development of a vaccine against brucellosis commonly called Brucella (M) vaccine (1), (2). The distribution of this vaccine to practicing veterinarians in Michigan began in the latter part of 1947.

Under agreement with the Michigan Department of Agriculture, licensed veterinarians may be approved to use this vaccine in the state, reports of its use to be made to the office of the State Veterinarian.

The writers felt that by a study of some of the records available possible answers to the questions propounded might be found.

As of October 1, 1949 the records show that 278 Michigan veterinarians have been approved to use the (M) vaccine, 4122 herd owners have signed agreements as to its use and reports made that 64,404 cattle have been treated.

In making this study from available records it was decided to concentrate attention on three counties. Each county file of owner agreements was checked and when cattle in a herd treated with Brucella (M) vaccine were next blood tested results were noted. It should be noted that it was not possible from the available records to follow the history of each individual animal in herd. Frequently, owners had only a portion of their animals vaccinated, when next blood tested a part only of the cattle may have been tested. These post vaccinal tests may have been made because an owner wished information, or to meet legal sale requirements. It was disappointing to note in the three counties studied 338 herds were treated and apparently 187 have not been blood tested since.

A requirement for the use of Brucella (M) vaccine is that the herd be blood tested prior to its use. In most of the instances reported this was done within 30 days prior to vaccination. All blood tests referred to were made in official laboratories. In interpreting blood titres blood showing complete agglutination at a dilution of 1/100 or higher was classed as positive. Blood sera giving complete agglutination at 1/25 dilution, complete or incomplete agglutination at 1/50 dilution were classed as suspicious.

In a few cases it may be noted in the tables that the vaccination was performed on a certain date and the "prevaccination" test is recorded on a later date. The explanation is that blood samples may have been drawn on the day the vaccine was administered and the blood samples not sent to the laboratory promptly. The dates given in the tables are those reported on the records.
Table 1.—Study of Blood Test Records of Cattle Treated with Brucella (M) Vaccine. County "B" Michigan

<table>
<thead>
<tr>
<th>LOT</th>
<th>PRE-VACCINATION</th>
<th>POST VACCINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2</td>
<td>1/14/48</td>
<td>Infected</td>
</tr>
<tr>
<td>B4</td>
<td>11/26/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B6</td>
<td>4/15/48</td>
<td>Clean</td>
</tr>
<tr>
<td>B11</td>
<td>12/26/47</td>
<td>Infected</td>
</tr>
<tr>
<td>B12</td>
<td>12/26/47</td>
<td>&quot;</td>
</tr>
<tr>
<td>B15</td>
<td>5/22/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B20</td>
<td>5/22/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B22</td>
<td>3/31/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B23</td>
<td>1/30/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B24</td>
<td>1/16/48</td>
<td>Clean</td>
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<td>B25</td>
<td>6/18/48</td>
<td>&quot;</td>
</tr>
<tr>
<td>B26</td>
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In "B" County, at the time these data were assembled Brucella (M) vaccine had been used in the cattle on 58 premises. Searching for subsequent blood tests on these same cattle we found a record of such retests on the same cattle of 22 owners. The data in Table 1 condense this material. All but 2 of the 22 lots of cattle were infected groups. It would appear that Brucella (M) vaccine did not cause persistent blood reaction in negative animals as on retest 114 of the original 128 negatives injected passed the blood test. Among the 29 animals classified as suspects or reactors on pre-vaccination test, 8 showed a decrease of blood titre, one positive reactor was classified as a suspect and seven suspects were classified as negative on post vaccinal test.
In County "C" at the time these data were examined Brucella (M) vaccine had been used in cattle on 105 premises. Post vaccinal blood tests were found on the same cattle of 31 owners. In Table 2 the record of such tests is given in condensed form. Of the 31 lots of cattle retested after vaccination with "(M)" 29 were infected groups. Of the 198 cattle with negative blood test at time of vaccination 168 were so classified. Of the 56 animals giving positive or suspicious blood reactions at time of treatment eleven showed definitely decreased titres on retest three original positives being classed as suspects and one classed as negative, seven original suspects were classified as negative.

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In "N" county when these data were compiled Brucella (M) vaccine had been used in the cattle on 175 farms. Examining the records for post vaccination tests on the same cattle were found them on record for cattle on 98 farms of which number 77 were infected groups.

Out of 573 cattle with negative blood prior to vaccination 544 were negative on the first retest. Of the 91 cattle giving positive or suspicious reactions at time of vaccination 39 showed decreased blood titres on retest, one original reactor became a suspect and 38 originally suspects were classed as negative.
USE OF BRUCELLA (M) VACCINE

TABLE 4
(Condensation of data in Tables 1, 2 and 3)

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<td>34</td>
</tr>
<tr>
<td>98 County &quot;N&quot;</td>
<td>573</td>
<td>82</td>
</tr>
<tr>
<td>151</td>
<td>899</td>
<td>136</td>
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</tbody>
</table>

TABLE 5.—Positive or Suspicious reactors showing significant decrease of blood titre after treatment with Brucella (M) vaccine.

<table>
<thead>
<tr>
<th>PRE VACCINATION</th>
<th>POST VACCINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cattle giving suspicious or positive reactions</td>
<td>Suspicious to negative</td>
</tr>
<tr>
<td>County &quot;B&quot;</td>
<td>29</td>
</tr>
<tr>
<td>County &quot;C&quot;</td>
<td>56</td>
</tr>
<tr>
<td>County &quot;N&quot;</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>176*</td>
</tr>
</tbody>
</table>

* 119 animals on retest showed the same reaction as on prevaccination test or increased from suspect to positive classification.

CONCLUSIONS

1. Eight hundred ninety-nine animals negative to blood test were treated with Brucella (M) vaccine and on retest eight hundred forty-one showed negative blood test. The fifty-eight developing suspicious or positive blood titres were all in infected herds. We conclude that Brucella (M) vaccine does not produce persistent blood agglutination reactions.

2. Of one hundred seventy-six animals giving suspicious or positive blood reactions prior to vaccination with Brucella (M) vaccine, fifty-eight showed decreased blood titres on retest. We conclude that the vaccine mentioned did not show evidence of significant therapeutic value.

REFERENCES


PROGRESS REPORT ON THE USE OF BRUCELLA "M" VACCINE UNDER CONTROLLED EXPERIMENTAL CONDITIONS

B. H. EDGINGTON, D.V.M. AND NELSON B. KING D.V.M.

Wooster, Ohio

This presentation is intended as a progress report of the bovine brucellosis investigations being conducted in Ohio. It represents in a large measure the cooperative effort of personnel of the Ohio Department of Agriculture, the College of Veterinary Medicine of the Ohio State University, and the Ohio Agricultural Experiment Station.

The work was initiated through authorization of the United States Bureau of Animal Industry to obtain Mucoid vaccine for experimental use. The Mucoid vaccine was made available through the generosity of the Brucella Laboratory, East Lansing Michigan in supplying the vaccine as needed.

The initial investigations have been under way slightly over one year. Considering the nature of these experiments and the limited period of their progress it should be readily apparent that such data as may be presented are definitely incomplete and at most can represent no more than a progress report. It should be equally obvious that prudence does not permit the formulation of definite conclusions based upon the incomplete and meager evidence thus far derived from these investigations.

The cattle used in these investigations may conveniently be classified into 3 groups: viz.:

(1) Laboratory Group—consisting of non reactor animals maintained under conditions of isolation intended to protect them against brucella exposure until such time as they might be experimentally challenged. Necessarily the number of animals composing these groups is relatively small.

(2) State Welfare Herds. Sizable herds of non reactor animals in which approximately 1/6 of the animals are used as non vaccinated herd controls. Occasionally cows are available from these herds for experimental challenge.

(3) Privately owned herds in which reactor animals were present and in which a limited number of non-reactor, non-vaccinated animals were retained as herd controls.

The primary objective of the work has been to obtain additional information on the use and merit of Huddleson's Mucoid Vaccine. To simultaneously undertake the investigation of all factors of interest and importance in the use of this vaccine was obviously impossible. The objectives of the initial investigations are to obtain additional data regarding (1) the agglutinin development following injection of "M" vaccine and (2) its ability to afford protection against infection from herd as well as experimentally brucella exposure.

The results of the work have been prepared as graphs and charts reproduced in the form of lantern slides. In an effort to avoid complexity and to thus render greater

1 Presented October 13, 1949 by Drs. B. H. Edgington and Nelson B. King, Department of Veterinary Science, Ohio Agricultural Experiment Station at United States Livestock Sanitary Association meeting Columbus, Ohio.
visibility, only such details have been included as were deemed pertinent to give illustration of the results obtained.

Slide 1 is presented to illustrate an averaged agglutinin titer development following the injection of Mucoid ("M") and B. A. I. Strain 19 vaccines in adult cows compared with similar non-vaccine-injected animals as controls.

The cows were of beef breeds 7 to 12 years in age and were a part of a breeding herd in which no brucellosis reactor animal had been found in tests covering the past 5 years.

Following vaccine administration they had been retained as a single unit under conditions of isolation intended to prevent brucellosis exposure.

"M" vaccine, 1 ml/cow, was given to 14 head and Strain 19, 5 ml/cow to 15 head. There were 7 head of non-vaccinated controls.

Agglutinin titers of blood serum collected from these animals were determined by the tube test method using serum dilutions from 1:25 to 1:12,800. The average titer of each group was based on the highest dilution in which complete agglutination was present for each animal.

It is recognized that the average titer obtained with the limited number of animals used might be markedly influenced by the titer of one or two members of the group. Therefore no statistical value should be given to the height of the individual curve attained at any single computation, however, it is believed that some indication of a possible agglutinin trend can be observed.

While there is a general parallelism in the curves of the "M" and Strain 19 vaccinates, it is obvious that agglutinin titer development of the "M" vaccinates under conditions of this test was much lower than that of the Strain 19 vaccinates and its
return to an average titer approximately negative in 1:25 dilutions occurred at a earlier date.

This slide illustrates titer obtained following vaccine administration to heifers ranging from 7 to 12 months in age at time of vaccination. There were 7 head in each the "M" and Strain 19 vaccinates, with an equal number of non-vaccinated controls.

These animals originated from a brucellosis negative herd and were maintained
as a single unit under protective isolation similar to those in Slide 1. The procedures used in obtaining the data were the same as those described for the adult cows.

The over-all results of this test was quite similar to that of the adult cows, however, the recession of the average titers to approximately negative in 1:25 dilutions in the younger group had occurred at the 58th day of test as compared to the 164 day in the case of the adult vaccinated group.

This slide illustrates results obtained in a privately owned accredited herd in which reactor cows had first been observed in tests around six months prior to the use of "M" vaccine in the herd. The results are those observed for a period of twelve months following vaccine administration. "M" vaccine, 1 ml/animal, was administered to 82 head of non-reactor females, 1 year and older in age, and to 18 heifers between 6 and 12 months of age. In the group of 82 older vaccinates 75 remained non-reactors at the end of the year following vaccination, 1 became a suspect and 6 became reactors.

**SLIDE 4.—Experimental Herd No. 1**

<table>
<thead>
<tr>
<th>STATUS AT VAC.</th>
<th>STATUS AT END OF ONE YEAR</th>
<th><strong>Aglutination</strong></th>
<th><strong>Calvings</strong></th>
<th><strong>Breeding</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td>36</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>Over 1 yr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Mo. to 1 yr.</td>
<td></td>
<td>11</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Suspicious</td>
<td></td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Reactor</td>
<td></td>
<td>7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Fifty nine (59) of the 75 non-reactor females had apparently normal calvings during the year, one aborted, 4 were bred but had not yet calved and 11 were still non pregnant.

One of the 7 originally non-reactor vaccinated cows became a suspect and calved normally. Six (6) became reactors 2 of which calved normally, 3 aborted and one did not conceive.

*Brucella* organisms were recovered by cultural methods from all abortions except the one non-reactor cow.

The 18 head vaccinated between the 6 and 12 months of age all remained non-reactors and none had calved.

Two of 5 cows showing reactor titers were vaccinated, one of which became a non-reactor and calved normally, the other continued as a reactor and aborted.

Only one of the 3 non-vaccinated reactors continued throughout the 12 month interval of the test and she aborted during this period. The remaining two non-
vaccinated reactors were slaughtered as a result of their failure to conceive following repeated services.

The arrangement of data in this slide follows the same form of presentation as was seen in Slide 3.

Abortions had occurred in this herd over the year prior to its use as an experimental unit and there were 21 reactor cows in the herd at the beginning of the test. Fourteen of the reactors were cows in which Strain 19 vaccine had been used subsequent to their becoming reactors. These 14 animals remained in the herd but because of their vaccinal status were not included in the data of this herd.

Thirty-five (35) of the 36 non reactor older animals received "M" vaccine and remained non reactors at the end of 12 months thereafter. Twenty-eight (28) calved normally, one prematurely, 4 had not as yet calved and 2 had not conceived. One of the original 36 non-reactor cows became a reactor but calved normally. None of the 11 non-reactor vaccinates in the younger group showed reactor titers at the end of the 12 months observation period and none had calved during this interval.

Two cows showing suspicious reactions at time of vaccination, both became reactors and aborted.

Seven (7) cows showing reactor titers were vaccinated. Two of these became non-reactors and calved normally, 5 remained reactors, one of which calved normally, 3 aborted and one had been slaughtered on account of breeding failure.

Ten (10) non-reactor cows were selected as non-vaccinated controls. Six (6) of the 10 controls remained in the herd throughout the test period, one met accidental death, one was slaughtered due to a fracture of the pelvis and 2 were removed because of failure to conceive.

The 6 remaining throughout the test, became reactors, of these 1 calved normally and 5 aborted.

*Brucella* organisms were recovered in the case of each abortion, but were not recovered from milk or vaginal swabs of the dam of the cow having a premature calf (265 days), which lived.

The majority of the reactor animals in both herds shown in Slides 3 and 4 were retained in the herds during the test period.

The fallacy of any attempt to formulate conclusions from the data presented on these two herds is quite apparent, since none of the 39 younger "M" vaccinates had as yet completed a gestation period following there vaccination at the time these results were recorded. Discussion of the value of 'M' vaccine in these herds must therefore await the further course of the experiments.

Slide 5. This slide shows the results obtained following experimental *brucella* exposure in a group of 26 beef cows, 7-12 years in age. This herd had been maintained as a non-reactor herd over a period of 5 years prior to their use as an experimental group.

Seven (7) cows were used as non vaccinated controls, 8 received "M" vaccine and 11 were given Strain 19 vaccine.

The cows were unbred at the time of vaccination and breeding was begun approximately 2 weeks later.

The individual blood titers of the cows shortly prior to their experimental *brucella* exposure is given in the left column of the slide and represents titers present between
the 7–8 months following vaccination. The agglutination tests were made with two fold serial dilutions of blood serum from 1:25 to 1:12,800. Other tests made following vaccine administration have been omitted to conserve space in the slide.

All controls and "M" vaccinates, except one, were showing less than complete agglutination at 1:25, at time of exposure. The exception had shown a 1:400 titer 30 days following vaccination but had gradually receded to 1:50 prior to exposure.

Slide 5.—Post Exposure Titers Adult Vac.

<table>
<thead>
<tr>
<th>PRE EXP</th>
<th>POST EXPOSURE</th>
<th>CALVED</th>
<th>BR AB RECVD.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 Day</td>
<td>Calving</td>
<td>30 Day</td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>50</td>
<td>0</td>
<td>1600</td>
</tr>
<tr>
<td>0</td>
<td>25</td>
<td>0</td>
<td>400</td>
</tr>
<tr>
<td>0</td>
<td>800</td>
<td>3200</td>
<td>1600</td>
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<tr>
<td>0</td>
<td>400</td>
<td>3200</td>
<td>6400</td>
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<td>12800</td>
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<td>100</td>
<td>3200</td>
<td>6400</td>
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<tr>
<td>M-Vaccine Group</td>
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<td>0</td>
<td>50</td>
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<td>200</td>
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<tr>
<td>B.A.I. 19 Group</td>
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<tr>
<td>800</td>
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The high titer of the #19 vaccinates were to be expected in adult vaccinated cows so soon following administration of that vaccine.

The cows were in the latter part of the 6th or early part of the 7th month of gestation at time of exposure. The exposure dose was 1,500,000 viable organisms of B.A.I. culture #2308, 0.05 ml. of culture being instilled into the lacrimal sac of each eye.

The second column from the left of the slide shows the titers at 30 days following exposure; the 3rd column the titers at time of calving and the 4th column the titers at approximately 30 days after calving. The remainder of the slide shows the out-
come of the gestations and bacteriological examinations. The titer development in these cows following exposure is readily apparent from a study of the slide.

Irrespective of titer response it is of interest to note that all cows in each of the vaccinated groups gave birth to apparently normal calves and at normal gestation periods, whereas such occurred in but 3 of the controls.

Bacteriological examination for the presence of 

Brucella by culture methods only, were made from the following source materials when available, viz: aborted fetuses, placenta, colostral milk and vaginal swabs.

Brucella organisms were recovered from none of the normal calving cows except one of the "M" vaccinates, whereas positive recoveries were obtained in each of the aborted calves and from the placenta of the cow credited with premature calving.

We repeat that this presentation is intended only as a progress report of experimental work now being undertaken in Ohio. The ultimate results that may be obtained in these and other herds under observation must await future developments. No conclusions have been made concerning the results of these tests, as we fully recognize that the work is incomplete and entirely inadequate to use as a basis upon which conclusions can at this time be made.
Swine brucellosis is often a serious economic problem to the swine breeder and according to Cameron (1) may result in an overall loss of two to three pigs per litter in a herd. In addition, the disease presents a public health problem and a menace to the health of other species of animals. After extensive study it is now known that swine may harbor all three species of *Brucella* under natural conditions. Naturally any species of animal which has been shown to be infected with the three species of *Brucella* must be regarded as a reservoir of brucellosis in both man and other animals. The precise manner in which cattle acquire *Br. suis* infection from swine is not known, but it has been experimentally demonstrated that intramammary inoculation of cows with *Br. suis* results in active infection.

It can be readily understood that an infection cycle between swine, cattle, and man is of considerable importance, not only to the industries involved, but also in the epidemiology of brucellosis in human beings. Since brucellosis generally is not transmitted from man to man, domestic animals are regarded as the chief source of human infection. Thus the control of the disease in man is largely dependent on the control of brucellosis in animals. This makes the problem of control one of vital importance to the veterinary profession and particularly those engaged in official livestock disease eradication programs.

This paper will not go into the details of the natural course of swine brucellosis and other features of the disease because these details have been very adequately covered in previous meetings of this association. (McNutt (2) 1938, Hutchings (3, 4, 5) 1943, 1944, 1947, and Cameron (6) 1948.) However an attempt will be made to compare in brief the basic concept of brucellosis control in cattle and swine.

In reviewing the record of livestock disease control in this country, it is obvious that the over-all philosophy has been to live without rather than with many of the diseases which affect domestic animals and especially those transmissible to man. As a portion of this program of control and eradication, brucellosis of cattle and swine has received considerable attention particularly during the past fifteen years.

Brucellosis has proved to be one of the most difficult disease problems. This has been due in part to the fact that no single plan of attack was successful under all conditions which has led to some confusion on the part of both owners and those

1 Published as Journal Series Paper No. 421 of the Purdue University Agricultural Experiment Station. These studies were supported in part by a grant from the Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture.
interested in control as a paid profession. In other words there has been an unwillingness on our part to recognize that different herds and various species often require a slightly different approach than we are accustomed to use. This is especially true when hard and fast rules and regulations are laid down without consideration of local authority and judgement.

It is with these thoughts in mind that an attempt is being made to clarify some of the differences and point out some of the reasoning behind these differences in the control and eradication of brucellosis in cattle and swine. A meeting of research workers interested in swine brucellosis was sponsored by the Bureau of Animal Industry in the spring of 1949. At this meeting it was the consensus that sufficient information is available to justify the veterinary profession to comply with requests of swine raisers for official plans for the control and eradication of this disease of swine. Such a program was drawn up and submitted to the proper authorities and you have heard the report as read.

There are essentially five fundamental steps or a combination of steps which may be used to control an infectious disease:

(a) Diagnose the infection.
(b) Eradicate the infectious agent.
(c) Eliminate the susceptible host (immunization).
(d) Maintain the infection and the susceptible host apart from one another (isolation).
(e) Application of therapeutic measures.

Four of these fundamental steps are used in the control and eradication of bovine brucellosis but they have not all been found applicable to the control of swine brucellosis. Let us examine each of these fundamental steps and apply them or discard them as non-applicable to the species in question.

(a) Diagnose the infection.

Brucellosis of both cattle and swine is routinely detected by means of the standard serum agglutination test and in the final analysis this test is the backbone of our entire brucellosis control and eradication program. In cattle the test has been shown by continued usage to be sufficiently reliable to warrant disposition of individual animals with success in the majority of cases. Hence interstate regulations and control programs have been based on the results of individual tests. In swine experience has shown that too many hogs may harbor Brucella organisms and fail to react to the test, thus the agglutination test is recommended for diagnosing brucellosis in a herd of swine, but it may fail to detect the disease in individual hogs.

We are all familiar with test and immediate slaughter of reactors as a successful plan of control for bovine brucellosis. In swine this procedure has failed in too many instances to be practical and probably the failure has been due in part to inability to detect all the infected hogs. Thus a unit or whole herd system for controlling the disease is recommended for hogs. This is feasible because of the rapid turnover in swine and also because the full value of breeding animals may often be realized by slaughter except in valuable purebreds. In other words a difference between brucel-
Swine Brucellosis Control

The control of swine brucellosis appears at the outset as one of the limiting factors in the usefulness of the serological test for swine. There seem to be three limiting factors in the usefulness of the test: (1) the absence of agglutinins in the blood of some swine during the early stage of the disease; (2) the presence of transient low titers in both infected and apparently non-infected swine; and (3) the disappearance of serum titers in some infected swine. From these statements, it can be seen that straight test and slaughter of reactor swine may well result in failure since some non-reacting but infected animals are often left in the herd. If an entire breeding herd is tested and found to be negative, considerable reliance may be placed on the brucellosis status of individuals in that herd, but if reactors are present, the negative swine should be viewed with suspicion. It is known that negative reacting individual swine from infected herds have been sold as brucellosis free and the buyer has regretted placing any reliance on the blood test because of subsequent brucellosis in his own herd following the introduction of such animals. In the authors' experience, most swine infected with brucellosis develop an agglutination response sometime during the course of the disease, but such response may be delayed or even disappear while Brucella organisms are still present in the body.

Another factor in swine brucellosis which is somewhat at variance with the disease of cattle is the tendency for swine to recover as far as the symptom of abortion and recession of serum agglutination titer are concerned. Although it is not always true, the agglutination response of cattle once infected tends to persist, but in swine the tendency is for the titer to recede with time. This naturally presents a temptation to salvage some valuable swine which now are negative or essentially negative to the blood test but which previously exhibited titers indicative of infection. This temptation should be tempered with judgment and unless conditions are ideal, such swine should be eliminated from contact with known susceptible animals.

Interpretation of agglutination test results is somewhat different in the two species of animals. Experience and extensive research have arbitrarily placed the 1:100 dilution of bovine serum as the diagnostic point. Cows which react at this dilution or above are considered infected while cows which react below the 1:100 dilution are considered negative or suspicious. In almost all sizeable herds of swine, there are low dilution reactors irrespective of the presence of proved Brucella infection. Therefore, a rule of thumb interpretation of the agglutination test has been proposed which in essence is as follows: incomplete reactors to the test are not considered as evidence of brucellosis unless there are reactors in the herd at the 1:100 serum dilution or above. This obviously requires the use of more judgment in the interpretation of test results and also requires the testing of the entire breeding herd. It should be apparent that blood test results should be considered also in the light of clinical manifestations in the herd.

(b) Eradicate the infectious agent.

This step implies not only the elimination of infected carrier animals, but also the destruction of Brucella organisms outside the animal body. The destruction of
Brucella on and about the premises does not differ markedly whether swine or cattle are involved. However, in the elimination of infected animals there is again the matter of accurate diagnosis. In cattle the reactors may be segregated and isolated or slaughtered based on individual blood tests, but in swine experience has not supported this method. Whole herds are segregated and isolated from their offspring or sold for slaughter rather than merely eliminating the reactors from the herd.

(c) Eliminate the susceptible host (immunization).

Again a fundamental concept in brucellosis control differs between the two species of domestic animal under discussion. In cattle a vaccine i.e. Strain 19 developed by the Bureau of Animal Industry is used widely as an adjunct to control and unfortunately often as a substitute for sound control and eradication. It is not the purpose of this dissertation to discuss the merits or demerits of vaccination but merely to show a difference in current methods for brucellosis eradication between swine and cattle. Numerous attempts have been made to satisfactorily immunize swine against brucellosis, but either because of the danger to man from using live Br. suis vaccines, the lack of satisfactory resistance produced by non-living vaccines or with live Br. abortus Strain 19 vaccine, immunization as a means of swine brucellosis control has not been nor is recommended today.

(d) Maintain infection and the susceptible host apart from one another (isolation).

This step is sometimes utilized in connection with calfhood vaccination in bovine brucellosis, but generally such a procedure is expensive from the standpoint of additional facilities and equipment and often requires too much time to be of much benefit in controlling bovine brucellosis. On the other hand with swine where there is a rapid reproduction rate and the duration of such isolation is short, this procedure has been demonstrated to have real merit. Again it must be emphasized that the segregation and isolation involves entire herds or units from the offspring rather than the isolation of individuals which react to the agglutination test. Most investigators have ultimately arrived at the conclusion that some form of test, segregation and delayed slaughter of the entire infected herd plus the rearing of offspring on clean ground is a feasible and practical method for swine brucellosis control.

(e) Application of therapeutic measures.

Each year new and often promising chemotherapeutic and antibiotic agents are suggested for use in brucellosis of all species. As yet there are no such agents which have received justifiable recognition for controlling brucellosis of either cattle or swine. It is conceivable that chemotherapeutic agents will be utilized sometime but at present it is necessary to combat brucellosis by some one or a combination of the four other basic steps.

Certain other variations in brucellosis of cattle and swine play a role in successful prevention and control. The bull, although known to be susceptible and, at times, even responsible for spread, does not compare with the boar as a medium of transmission. Infected boars commonly eliminate Brucella in the semen in tremen-
dous concentration and have been shown to spread the disease both experimentally and under natural conditions.

As you are all aware the success of any swine breeding program revolves around good boars and it is necessary to be constantly searching for superior sires. Thus in view of past remarks concerning the limitations of diagnosis, it is desirable to purchase boars with extreme caution and preferably from herds known to be free of brucellosis. If such is not possible boars should be purchased well in advance of their use and repeated tests applied before being placed in the herd. The same precautions should be used in purchasing females for breeding.

Another factor which often discourages swine brucellosis control is the large number of animals involved. This is rather simply overcome by handling the swine in smaller, segregated groups at all times. In fact not only from a disease control but also from a better management standpoint this procedure is helpful.

In conclusion, it has been the personal experience of the author that valuable herds of swine severely infected with brucellosis have been successfully freed of infection by use of plans of control as outlined by your committee on brucellosis. Thus on a limited scale actual field application of these procedures have been successful and thus removes such a program from the realm of pure theory. Again, although the fundamental principles of brucellosis control and eradication in cattle and swine are similar, a consideration of the differences is essential for sound brucellosis control. It must be remembered that we as a profession are interested in brucellosis control irrespective of the species involved since the economic and public health aspects of the disease are important to those we attempt to serve.

REFERENCES

INACTIVATED BRUCELLA ABORTUS AS AN IMMUNIZING AGENT IN CATTLE

A PRELIMINARY REPORT

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Studies on immunization of cattle against brucellosis have been almost continuous in various parts of the world since shortly after discovery of the causative organism.

Cultures of \textit{Brucella abortus} killed with heat or chemicals have been tried extensively but the consensus of opinion is that while the method was not harmful either no immunity or one of very short duration resulted. Later work with live virulent cultures showed that while immunity might be induced, udder infections and permanent carriers followed and as a result this method has fallen into disrepute.

Buck (1) and Cotton, Buck and Smith (2) showed that it was possible to immunize cattle with a living attenuated organism given when the animals were between 4 and 8 months of age. The use of their Strain 19 vaccine has since come into widespread use for prophylactic purposes and is undoubtedly the best agent for that purpose now known. It is well known that subcutaneous injection of this vaccine produces an agglutinin titer indistinguishable from that of natural infection, which, in some instances, may persist for some time after the animals have reached breeding age. Huddleson and Bennett (3) have recently attempted to overcome this and at the same time immunize the animal by the use of a mucoid phase of living \textit{Brucella suis}.

Several years ago Levinson, Oppenheimer et al. (4) reported on the use of an ultraviolet light for inactivating suspensions of organisms and viruses including \textit{Escherichia coli}, \textit{Salmonella typhosa}, \textit{Staphylococcus aureus}, \textit{Streptococcus viridans}, \textit{Diplococcus pneumoniae}, \textit{Shigella dysenteriae} (5), St. Louis encephalitis, the Lansing strain of poliomyelitis and rabies viruses. During their early work our laboratories were in close cooperation with them and among other organisms exposed to the rays of their ultraviolet lamp, in an attempt to produce active immunizing agents, was \textit{Brucella abortus}.

This report is a preliminary one of our experiments with suspensions of \textit{Brucella abortus} inactivated by exposure of continuously flowing thin films to ultraviolet irradiation.

METHODS AND MATERIALS

Preliminary work showed that a virulent strain of \textit{Brucella abortus} grown on solid medium under 10\% carbon dioxide and suspended in sterile 0.85\% sodium chloride solution could be inactivated satisfactorily when the bacterial content was established at 4000 million/ml. That the organisms had been inactivated was deter-
mined by tests in suitable culture media and by subcutaneous injection of relatively large quantities into 400–600 gm. male guinea pigs.

Tests on guinea pigs indicated that these irradiated suspensions had antigenic value. It was thought that if absorption of the product could be delayed greater immunity might be conferred and accordingly irradiated suspensions were precipitated by the addition of 4% potassium alum solution.

The results of immunity tests on guinea pigs, following subcutaneous injection of these alum precipitated irradiated suspensions, were sufficiently promising to warrant work in cattle.

An experimental herd of negative open heifers (4 to 5 months of age) was established. From time to time the size of the herd was increased to a maximum of 30 including untreated controls by addition of negative open heifers ranging from 1 year to 15 months of age.

As shown in Table I two animals were each given 2–5 ml. doses of the fluid irradiated bacterin at intervals of one month. The remainder, except controls, were given one or two doses of the alum precipitated bacterin. Under the conditions of the experiment, all animals were pasture bred, and later challenged by instillation of 1.5 or 2.0 million of the homologous Brucella abortus into the conjunctival sac. Virulence was such that 5000 organisms produced lesions of infection in the majority of the 400–600 gm. male guinea pigs injected.

In the beginning, blood samples were drawn at weekly intervals for agglutination tests which were made by the rapid plate method against an antigen prepared from B. A. I. Strain 19 according to the method outlined by the Bureau. Later tests have been made at monthly intervals.

Within 48 hours after termination of pregnancies, milk samples from each quarter and uterine secretions were cultured separately for the presence of Brucella abortus. Milk samples were pooled and 5 ml. quantities injected subcutaneously into 400–600 gm. male guinea pigs. At the end of 6 weeks, the pigs were bled for agglutination tests, sacrificed and lesions noted. The spleen of each was cultured. All cultures were made on crystal-violet bactotryptose agar and plates were incubated at 37°C under 10% carbon dioxide. No culture was regarded as negative until it had been incubated for 18 to 21 days.

Identification of Brucella abortus recovered from any source was based on morphology, staining reaction, cultural characteristics and agglutination by a specific serum.

In Table I are listed some of the more pertinent data obtained from this experimental herd since it was established.

In the early part of 1946 a herd of 53 naturally infected registered Holstein-Freisan became available for study.

Seven abortions had occurred during the 5 months prior to our preliminary agglutination tests in which 56.6% of the animals including 12 heifers of various ages previously treated with Strain 19 vaccine showed positive reactions.

A part of the negative cows and heifers above 4 months of age and a part of the positive cows were given one 5 ml. subcutaneous injection of the alum precipitated irradiated bacterin. The remainder were left untreated as controls. Those heifers previously treated with Strain 19 vaccine received no further treatment.
<table>
<thead>
<tr>
<th>COW NO.</th>
<th>BACTERIN</th>
<th>MAXIMUM AGGLU-</th>
<th>MAXIMUM TITER</th>
<th>DATE</th>
<th>AGGLU-</th>
<th>MAXIMUM TITER</th>
<th>TITER LAST BLEEDING</th>
<th>CALVING</th>
<th>BR.</th>
<th>AUTOPSY</th>
<th>BR. ABO-</th>
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<tr>
<td>2373</td>
<td>5 cc AP 8-28-45</td>
<td>4 wks.</td>
<td>+1:4000, P 1:5000</td>
<td>9-12-46</td>
<td>PT</td>
<td>+PT 9-8-46</td>
<td>-PT 9-8-46</td>
<td>5-20-48</td>
<td>1-17-47</td>
<td>No</td>
<td>5-20-48</td>
</tr>
<tr>
<td>(4-5 mo.)</td>
<td>5 cc AP 10-2-45</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
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<td>4 wks.</td>
<td>+1:4000, P 1:5000</td>
<td>&quot;</td>
<td>PT</td>
<td>+PT 9-24-46</td>
<td>+PT 9-24-46</td>
<td>5-20-48</td>
<td>1-16-47</td>
<td>No</td>
<td>5-20-48</td>
</tr>
<tr>
<td>(4-5 mo.)</td>
<td>5 cc AP 10-2-45</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4-5 mo.)</td>
<td>5 cc Fld 10-2-45</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>P 1:1500</td>
<td>&quot;</td>
<td>-</td>
<td>++++T 10-29-46</td>
<td>++++PT 10-29-46</td>
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<td>1-22-47</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2367</td>
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<td>-</td>
<td>-</td>
<td>&quot;</td>
<td>-</td>
<td>PPT 8-26-46</td>
<td>PPT 8-26-46</td>
<td>6-20-48</td>
<td>6-20-48</td>
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<td>Died 8-20-46</td>
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<tr>
<td>(1 yr.)</td>
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</tr>
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<td>&quot;</td>
<td>+++T</td>
<td>+PT 2-17-48</td>
<td>+PT 2-17-48</td>
<td>5-25-48</td>
<td>5-25-48</td>
<td>No</td>
<td>5-25-48</td>
</tr>
<tr>
<td>(1 yr.)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>(1 yr.)</td>
<td></td>
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<td></td>
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<td></td>
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<td>++++++T</td>
<td>&quot;</td>
<td>+++T</td>
<td>+++P 8-13-47</td>
<td>+++P 8-13-47</td>
<td>5-20-48</td>
<td>5-20-48</td>
<td>No</td>
<td>5-20-48</td>
</tr>
<tr>
<td>(1 yr.)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Case</td>
<td>Age</td>
<td>Date</td>
<td>Time</td>
<td>PT</td>
<td>T</td>
<td>P</td>
<td>Date</td>
<td>Time</td>
<td>PT</td>
<td>T</td>
<td>P</td>
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</tr>
<tr>
<td>2408</td>
<td>1 yr</td>
<td>5 cc AP</td>
<td>3-17-47</td>
<td>8 wks.</td>
<td>++++</td>
<td>+++PT</td>
<td>1-10-48</td>
<td>+++P</td>
<td>8-13-47</td>
<td>+++</td>
<td>8-16-48</td>
</tr>
<tr>
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<td>3-17-47</td>
<td>8 wks.</td>
<td>++++</td>
<td>+++T</td>
<td>8-13-47</td>
<td>+++T</td>
<td>8-14-47</td>
<td>6-25-48</td>
<td>No</td>
</tr>
<tr>
<td>2370</td>
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<td>P</td>
<td>++++</td>
<td>12-17-47</td>
<td>+++PT</td>
<td>5-20-48</td>
<td>2-1-48</td>
<td>No</td>
<td>Milk</td>
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<td>2428</td>
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<td>T</td>
<td>++++</td>
<td>5-25-48</td>
<td>No</td>
<td>No</td>
<td>Whey</td>
<td>pos.</td>
<td>agg.</td>
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<tr>
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<td>5 cc AP</td>
<td>10-17-47</td>
<td>4 wks.</td>
<td>++++PT</td>
<td>1-20-48</td>
<td>+++P</td>
<td>4-15-48</td>
<td>+P</td>
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<tr>
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<td>5 cc AP</td>
<td>10-17-47</td>
<td>4 wks.</td>
<td>++++</td>
<td>+++</td>
<td>2-17-48</td>
<td>+PT</td>
<td>8-25-49</td>
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<td>(a)</td>
</tr>
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<td>10-17-47</td>
<td>4 wks.</td>
<td>++++</td>
<td>+++</td>
<td>2-17-48</td>
<td>+PT</td>
<td>8-26-48</td>
<td>7-30-48</td>
<td>No</td>
</tr>
<tr>
<td>2473</td>
<td>1 yr</td>
<td>5 cc AP</td>
<td>10-17-47</td>
<td>4 wks.</td>
<td>++++</td>
<td>+++</td>
<td>2-17-48</td>
<td>+PT</td>
<td>8-26-48</td>
<td>7-30-48</td>
<td>No</td>
</tr>
<tr>
<td>2474</td>
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<td>2-17-48</td>
<td>T</td>
<td>8-26-49</td>
<td>8-1-48</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>5-20-48</td>
<td>Diad</td>
<td>4-30-48</td>
</tr>
<tr>
<td>2476</td>
<td>1 yr</td>
<td>5 cc AP</td>
<td>10-17-47</td>
<td>4 wks.</td>
<td>++++</td>
<td>+++</td>
<td>2-17-48</td>
<td>+PT</td>
<td>4-15-48</td>
<td>3-28-48</td>
<td>No</td>
</tr>
<tr>
<td>2478</td>
<td>1 yr</td>
<td>5 cc AP</td>
<td>10-17-47</td>
<td>8 wks.</td>
<td>++++</td>
<td>+++</td>
<td>2-17-48</td>
<td>+PT</td>
<td>10-30-48</td>
<td>9-20-48</td>
<td>No</td>
</tr>
</tbody>
</table>
Under headings "Bacterin", "A.P." = alum precipitated product — 4000 million organisms/ml.
Under headings "Agglutinin Titer", symbols denoting degree of agglutination are given in the following sequence of serum dilutions: 1:25, 1:50, 1:100, 1:200, 1:400.

Cows 2369, 2373-74, 2377-78 and 2382 to 2428 inclusive challenged by instillation of approximately 1.5 million Brucella abortus into the conjunctival sac.

Cows 2470 to 2484 challenged by instillation of approximately 2.0 million Brucella abortus into the conjunctival sac.

* Animals so designated under "Autopsy" are under observation.

(a) (b) (c)—Due to calve November, 1949.
INACTIVATED BRUCELLA ABORTUS

TABLE II.—Naturally Infected Holstein Herd. Data as of 9/13/49

| No. of animals above 4 mo. of age 4/24/46 | 53 |
| No. of abortions prior to 4/24/46 | 7 |
| No. of animals showing positive or suspicious agglutinin titer including | 30 |

| 12 heifers previously treated with Strain 19 vaccine. |

**Summary**

<table>
<thead>
<tr>
<th>NO.</th>
<th>SELL OR DIED</th>
<th>TERM INATION OF PREGNANCIES 4/24/46 TO 9/13/49</th>
<th>BR. ABORTUS FROM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AT TERM</td>
<td>ABRATION</td>
</tr>
<tr>
<td>Pos. cows trtd.</td>
<td>8</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Pos. cows untrtd.</td>
<td>7</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Neg. cows trtd.</td>
<td>5</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Neg. cows untrtd. (b)</td>
<td>8</td>
<td>3</td>
<td>21 (a)</td>
</tr>
<tr>
<td>Neg. heifers trtd.</td>
<td>17</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Neg. heifers untrtd. (c)</td>
<td>14</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Strain 19 heifers</td>
<td>12</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

(a) Including 3 weak calves which died or were destroyed in 48 hours after birth.  
(b) Four of this group showed suspicious or positive reactions on last test.  
(c) Four animals showed suspicious reactions on last test.  
(d) Br. abortus not recovered. Reaction negative up to 5/24/49 when PT-.

TABLE III. Naturally Infected Guernsey Herd. Data as of 5/19/49

| No. of animals (including bulls) above 4 mo. of age 9/20/46 | 92 |
| No. of abortions prior to 9/20/46 | 16 |
| No. of animals showing positive or suspicious agglutinin titer | 55 |

**Summary**

<table>
<thead>
<tr>
<th>NO.</th>
<th>SELL OR DIED</th>
<th>TERM INATION OF PREGNANCIES 9/20/46 TO 5/19/49</th>
<th>BR. ABORTUS RECOVERED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AT TERM</td>
<td>ABRATION</td>
</tr>
<tr>
<td>Pos. cows trtd.</td>
<td>27</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Pos. cows untrtd.</td>
<td>28</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Neg. cows trtd.</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Neg. cows untrtd.</td>
<td>5</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Neg. heifers trtd.</td>
<td>9</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Neg. heifers untrtd.</td>
<td>9</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Strain #19 heifers</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

(a) From milk only.  
(b) Three with reactions T- +P, and +1:1600 on last test.  
(c) Remaining animals showed reactions from T- to +1:1600 on last test.

As in the experimental herd, agglutination tests were made at monthly intervals for two-and-one-half years. Since that time the period has been extended to approximately three months. So far as possible, milk samples and uterine secretions
have been obtained at the termination of each pregnancy. Cultures and guinea pig inoculations were made as described for the experimental herd.

Results in this herd have been summarized in Table II.

Another herd of 93 naturally infected pure bred Guernseys was presented for observation in the fall of 1946.

Prior to preliminary agglutination tests, 16 animals had aborted. Approximately 60% of the preliminary tests showed suspicious or positive reactions. One dose of 5 ml. of the alum precipitated irradiated bacterin was given to a part of the animals showing suspicious or positive reactions, and similar quantities to part of the negative animals. The remainder were left untreated as were four heifers previously treated with Strain 19 vaccine.

It was not possible to obtain material for bacteriological study at the termination of each pregnancy since the start of this experiment but samples of milk, uterine secretions and fetal materials were obtained from a sufficient number to confirm the presence of infection as previously determined by agglutination tests.

The data accumulated during the observation of this herd have been summarized in Table III.

DISCUSSION

Subcutaneous injection of two doses of 5 ml. each of the irradiated suspension of *Brucella abortus* into two heifers resulted in a rapid increase in agglutinin titer which receded rather rapidly. While neither of these animals aborted after artificial infection, it seems apparent that no appreciable immunity was conferred since *Brucella abortus* was recovered from both after calving. One of these (S2377) is still in the herd and was shedding the organism in the milk when tested after her last calving.

Subcutaneous injection of the alum precipitated irradiated bacterin in doses of 5 ml. given singly or twice at intervals of one month was followed by an appreciable rise in agglutinin titer, the maximum being reached usually in 4 weeks after a single dose and also after the same time following a second dose.

In the naturally infected herds it was found that most of the negative heifers treated when 4 to 5 months of age developed agglutinin titers which persisted for from 8 to 10 months. A few positive or suspicious reactions persisted for from 14 to 24 months. These titers in adult animals have persisted for a much longer period, some for over 3 years.

No evidence of general reactions have been noted following injection of the alum precipitated product but usually, a local reaction of varying degrees of severity was noted. In a few cases an indurated area persisted for as long as two months.

Some of the alum precipitated bacterin treated animals in the experimental herd have been observed through one and others through two pregnancies, all of which have been normal. In no case has *Brucella abortus* been recovered from any of these when material was obtained after parturition or any of the treated animals which were sacrificed and autopsied. Unfortunately none of the controls aborted, although infection was definitely established in 4 of the 10 used. Three of these are still in the herd. *Brucella abortus* was recovered from the milk of one control slaughtered.

A study of the records of the naturally infected Holstein herd would seem to
indicate that a single dose of the alum precipitated irradiated bacterin injected into previously infected cows had little or no therapeutic value. One cow given a single dose 6 weeks after aborting continued to show an agglutinin titer positive in dilutions of 1:1600 and aborted her next calf at 207 days. *Brucella abortus* was recovered from the milk but not from the aborted fetus and again from the milk three months later. Another cow originally in the untreated positive group aborted two successive calves and was given two doses of the alum precipitated product at intervals of a month, the first dose having been injected two weeks after the second abortion. Her next calf was normal at 281 days gestation but she was shedding *Brucella abortus* in the milk at that time. This cow was sold for economic reasons when her next pregnancy was advanced 7 months. The course of infection in this particular

TABLE IV. Cow No. 326

Date of birth: 8/29/40

<table>
<thead>
<tr>
<th>DATE OF BLEEDING</th>
<th>1:25</th>
<th>1:50</th>
<th>1:100</th>
<th>1:200</th>
<th>1:400</th>
<th>1:800</th>
<th>1:1600</th>
<th>1:3200</th>
<th>1:6400</th>
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<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>4/24/46 to 2/12/47**...</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3/12/47...........</td>
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<td>P</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>4/16/47 to 5/24/49*......</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>T</td>
</tr>
</tbody>
</table>

*T* Tests at monthly intervals during these times.
*Negative tests also on 1/15/47, 2/7 and 12/47.
*a* *Brucella abortus* from uterus
*Brucella abortus* infection in guinea pigs injected with milk but organism not recovered. Cultures of fetal material not made.
*c* Calf premature but fully developed and weak. Destroyed. Placenta retained. *Brucella abortus* from milk.

animal was probably no different than would have occurred without any treatment. The incidence of carriers was the same in both positive groups.

All the cows treated when negative have carried their calves full term and *Brucella abortus* has not been recovered from any. The same is true of those animals treated at 4 months to 1 year of age. Others in this group have not yet calved because of age. In the group of previously negative untreated cows, 4 showed suspicious or positive reactions at the last test. An equal number of previously negative untreated heifers were suspicious at that time.

Of particular interest is the history of one cow in the negative untreated group which is cited because of the recovery of *Brucella abortus* from the uterus after a full term pregnancy and a negative agglutinin titer for a considerable period of time after calving.

The results obtained in the naturally infected Guernsey herd summarized in Table III, from the records available, seem to further indicate that the administra-
tion of the alum precipitated irradiated bacterin to previously infected cows was not followed by any therapeutic benefit, either in controlling abortions or elimination of carriers.

*Brucella abortus* was recovered from the milk of one cow at the termination of a normal pregnancy; this cow having shown a negative agglutination test when treated three months previously. It is possible that the organism may have been present at that time and agglutinins had not developed.

It is unfortunate that material was obtained for bacteriological study from only one negative treated heifer and no negative untreated ones after full term calvings. However no abortions occurred but on the last test three of the latter group showed titers ranging from T− to +P and + at 1:1600. The originally negative untreated cows remaining in the herd when the last test was made showed agglutinin titers ranging from T− to + at 1:1600.

The one abortion (at 7 mo.) which occurred in a Strain 19 vaccinated heifer was probably due to some factor other than *Brucella abortus* since only a PT− reaction was noted six months later. No material was available for bacteriological study.

It would seem from the limited number of animals used that a single dose of 5 ml. or two doses of the same quantity of the alum precipitated irradiated bacterin given at intervals of 4 weeks to heifers 4 months to 1 year of age does confer immunity against infection by *Brucella abortus*.

It is possible that greater immunity might be conferred if one dose were given during calfhood followed by a second one immediately after the first calving. However, this might be undesirable from the standpoint of production of positive agglutinin titers which are undesirable under present plans of control of brucellosis.

**SUMMARY**

Virulent *Brucella abortus* suspended in sterile physiological sodium chloride solution can be inactivated by exposure of continuously flowing thin films to ultraviolet light irradiation.

Such inactivated suspensions have antigenic value which appears to be enhanced when precipitated with 4% potassium alum solution.

These precipitated irradiated bacterins injected subcutaneously into cattle in doses of 5 ml. cause no appreciable general reaction but may be followed by a local reaction characterized by induration at the site of injection. These indurations may persist 8 weeks or longer. No abscesses have been noted in any of the animals treated.

A maximum rise in agglutinin titer usually occurs in about 4 weeks following injection. In younger animals this may gradually return to negative in 8 to 10 months but in a few a suspicious or positive reaction may be noted for from 14 to 24 months. In adult animals this agglutinin titer was found to persist much longer, in some cases over 3 years.

From the results obtained in the limited number of animals used it would seem that this alum precipitated irradiated bacterin has no therapeutic value when given to infected animals, either in controlling the abortion rate or the incidence of carriers.
INACTIVATED BRUCELLA ABORTUS

Alum precipitated irradiated *Brucella abortus* bacterin given to heifers of 4 months to 1 year of age seems to have antigenic value and may possibly be an aid in the control of brucellosis of cattle. It is realized that for the purpose of evaluating any product intended as a prophylactic against this disease, the number of animals which have been under observation is rather limited. However, it is believed that a report of these results is justified at this time because they seem sufficiently promising to warrant further controlled experiments and clinical application.

REFERENCES

THE FORMATION AND ACTIVITIES OF THE NATIONAL BRUCELLOSIS COMMITTEE

W. D. KNOX

Editor, Hoard's Dairyman, Fort Atkinson, Wisconsin

Following the end of World War II and the return of comparative normalcy in our living and working environment, a survey of the national brucellosis control and eradication effort showed clearly that considerable ground had been lost between 1941 and 1947. The incidence of brucellosis in cattle had approximately doubled. Everyone concerned with the future of a healthy, profitable livestock agriculture—a permanent agriculture—recognized that lost ground must be made up, and brucellosis eradication carried out to its eventual completion.

Unfortunately, confusion had grown and predominated in the livestock industry. This was brought about and accentuated by widely divergent control programs among the several states; difficulties in shipping livestock interstate; and, of considerable importance, a rash of articles—often irresponsibly written—in the general and livestock farm press. The experiences of 1946 and 1947 producer meetings are too recent to bear repeating. Suffice to say that in some areas brucellosis control and eradication were in serious jeopardy caused by the lack of livestock producer support. That lack of support was usually due to misinformation, misunderstanding and, in some instances, to unrealistic legislation.

Fully appreciating that brucellosis could not be controlled and eradicated without the active support of the farmer, many of you here—leading practitioners, sanitary officials and livestock men—took a fresh look at the problem and came up with a logical approach. Beginning with a September 1947 meeting in Washington, you set the wheels in motion to bring about more uniform state legislation. Livestock men played a prominent part in that meeting. Sentiment was also recorded to encourage greatly expanded educational work.

At the December 1947 meeting of the U. S. Livestock Sanitary Association, your Brucellosis Committee threshed out recommendations for uniform state legislation to control brucellosis. With very few exceptions, these recommendations have received widespread endorsement from all sections of the industry. Amendments have been made and will be made, of course. At this same 1947 meeting your Brucellosis Committee wrote into its report a strong statement on educational policy, and specifically recommended that that president of the U. S. Livestock Sanitary Association and the chief of the Bureau of Animal Industry appoint a joint committee of research workers and sanitary officials to review the literature on brucellosis and bring forth a "Bill of Proven Facts." This assignment was carried out and the publication is now available for distribution. Such was the thinking in late 1947.

In June 1948, under the leadership of the Bureau of Animal Industry, a Midwest

1 Paper Presented to the 53rd Annual Meeting of the United States Livestock Sanitary Association, Columbus, Ohio, October 11, 1949

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Brucellosis Conference was held in Chicago, which was well attended by livestock owners or their representatives, veterinarians, sanitary officials and others. This conference unanimously recommended the formation of an independent organization to guide and vigorously promote brucellosis eradication. It was the intent of the conference that this organization be predominately controlled and guided by farmers or their representatives. The chief of the Bureau of Animal Industry was specifically requested to call the formation meeting so that the wheels might be set in motion.

In January 1949, a Northeastern States Brucellosis Conference was held in New York City. This group unanimously endorsed the Midwest Brucellosis Conference recommendation. As a result of this expression, the chief of the Bureau of Animal Industry arranged for meeting facilities, and every conceivably interested group was invited to participate in organizing what is now known as the National Brucellosis Committee, March 15, 1949, in Washington, D.C.

In our mind, there was no evidence of domination by any group at that meeting. In fact, the session was so loosely organized and handled it almost fell apart at the seams. Tag ends were picked up, however, and a rather loose package assembled in the form of a group of organizations that were to be invited to make up the National Brucellosis Committee. Your speaker was given the title of temporary chairman and was instructed to arrange for the formation meeting and invite the following organizations to participate:

- Purebred Dairy Cattle Association
- National Beef Breeds Association
- American Medical Association
- U.S. Public Health Service
- American Public Health Association
- American National Live Stock Association
- U.S. Bureau of Animal Industry
- American Veterinary Medical Association
- United States Livestock Sanitary Association
- The National Grange
- American Farm Bureau Federation
- National Farmers Union
- Texas and Southwestern Cattle Raisers Association
- American Meat Institute
- National Live Stock and Meat Board
- National Association of Swine Records
- National Live Stock Loss Prevention Board
- National Wool Growers Association
- Extension Service or Association of Land-Grand Colleges and Universities

All 19 organizations agreed to participate with the exception of the Extension Service and its director recommended that the Association of Land-Grand Colleges and Universities act in its place. Since the March 15 meeting the National Cooperative Milk Producers Federation and the National Research Council have been added to the Committee.

The formation meeting of the National Brucellosis Committee was held in Chi-
W. D. KNOX

cago May 10, 1949 at which time Clinton K. Tomson, representing the National Beef Breeds Association, was made permanent chairman and the speaker secretary. A preliminary program of work was submitted. It included education, research, promotion and legislation. The last point was almost a stumbling block. Delegates were inclined to duplicate the long, laborious and trying work of the Brucellosis Committee of the U. S. Livestock Sanitary Association. The discussion lead to an effort to dissolve the committee. It did not prevail, though the meeting broke up after a comparatively short session. The officers were instructed to appoint subcommittees and arrange for the next meeting to be held here in Columbus, October 11. That meeting has been held with excellent attendance, and this paper was prepared following our Tuesday meeting. This is what has taken place:

First, the National Brucellosis Committee unanimously approved the dissolution of the legislation subcommittee, making clear the division of responsibility it thought desirable between the Brucellosis Committee of the U. S. Livestock Sanitary Association and the National Brucellosis Committee. The aims, objectives and work of the National Brucellosis Committee are now well defined within the fields of education, information, promotion and research. Following is our permanent organization and the beginning approach to our work:

Executive Committee

Clinton K. Tomson  R. W. Smith
J. F. Cavanaugh    J. H. Steele
W. S. Moscrip      Ray W. Willoughby
S. H. McNutt       W. D. Knox

Education and Information

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

1. With unimpassioned, frank logic impress the livestock owner with the basic desirability and absolute necessity of living without brucellosis in the livestock industry.
   b. Individual farm examples.
   c. Health of the farm population—demonstrated contrast in free and infected areas.
2. Disseminate latest reliable findings of research bearing on brucellosis; cite chapter and verse of experimental procedures and results; avert vague generalities and minimize opinions.
3. Relate success of areas eradicating brucellosis, proving it can be done.
4. Recognition and publicizing of individuals and organizations making noted contribution to brucellosis control through education, research, legislation and/or results achieved.
5. School essay and poster contests.
Avenues of Approach

1. National, state and local farmer meetings—effective, qualified speakers who have confidence of the farmers. Establish Speakers Bureau. Use visual aids charts, slides, movies; educational exhibits at meetings and shows.
2. Seek cooperation of practicing veterinarians to assist in greater veterinarian to farmer education. Distribution of reliable literature.
3. Farm radio.
4. Farm press.
5. County newspapers.
6. County agents.
7. Vo-ag teachers.
8. 4-H agents.
10. Livestock breed associations and fieldmen.
11. Marketing agencies and representatives.

Research

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

1. Keep tab on all brucellosis research and demonstration projects. Maintain a current record.
2. Compile or sponsor the compilation of all past research work done on brucellosis; locate and investigate any unpublished work and keep record of it.
3. Encourage expansion of research along lines now considered neglected. Contact institution heads; aid in obtaining finances for project work.
4. Publish regularly a research bulletin, cataloging work in process, projects completed and findings. A technical report.

Procedures

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

1. Develop suggested, detailed, promotional procedures which may be used at national, state and local levels to carry out the brucellosis eradication program. Disseminate these procedures to extension workers and others responsible for administration of program of this type.
2. Stimulate the organization of specific state and county committees or groups devoted solely to brucellosis control. An extension of program of national committee. Let state and local committees work on details of local legislation and program, using guides offered by the United States Livestock Sanitary Association and information from the National Brucellosis Committee.
3. Affiliate livestock and public health groups actively with aims and objectives of National Brucellosis Committee.
There you have the organization—the mechanism—which we hope and now are convinced will do work that must be done. Now you may ask, what is our primary objective? Through an organization, in which we hope farmers will have confidence, our entire energies will be devoted to stimulating the greatest possible voluntary farmer participation in brucellosis control and eradication. Our intent is to build from the soil up rather than from Congress down. We fully appreciate that a voluntary program alone is not enough. Although we will not be active legislative-wise, we recognize the necessity for legislation if eradication is to be realized. Legislation alone, however, will fall far short of doing the job without the cooperation of the livestock owner.

We believe that widespread voluntary farmer participation and work will help us rid our industry of brucellosis more economically than will heavy reliance on tax funds to pay him for doing what many would do on their own were they well-informed.

This then is our approach. Please appreciate that we are barely underway. Changes in organization, operation and technique should be expected, but the fundamental objective will remain. On behalf of the National Brucellosis Committee, we appreciate the opportunity to sketch for you a rough outline of our organization and work. Please be advised that we do, and will, solicit and encourage your individual and collective counsel.
REPORT OF COMMITTEE ON BRUCELLOSIS


Your Committee on brucellosis, after several open meetings wherein free discussion on the various problems occurred, submits the following for your consideration:

LEGISLATION

Recommendations for Congressional Action

Authorization for the Secretary of the United States Department of Agriculture to promulgate regulations governing interstate movement of animals affected with or exposed to brucellosis.

Recommendations for State Legislation

1. In the initial stages of brucellosis control in an area, the state shall sponsor a program when 65% of the livestock owners holding at least 51% of the cattle have placed their cattle under any one or a combination of the four plans set forth below. Those owners not participating shall not be compelled to come under the program. As brucellosis control and eradication advances in a given area, the point will eventually be reached where the incidence of infection is very low. At that time the few remaining vestiges or pockets of infection must be eliminated. When 75% or more of the livestock owners holding 95% or more of the cattle in a given area sign up under any one or a combination of the four plans, the livestock sanitary official may require the remaining livestock owners to individually select and come under one of the four plans described herein.

2. Reports to state and federal cooperating agencies of all activities, such as agglutination tests and vaccination, in connection with the disease, on forms furnished by the state or federal cooperating agencies must be compulsory.

3. A permanent brand with the letter "B" not less than 2 inches high and 2 inches wide on the left jaw of all reactors, excepting registered purebred cattle or cattle eligible to registry, otherwise permanently identified, and quarantine of such reactors to the premises where found, limiting movement of these animals by permit of state officials, to slaughter at points where state or federal inspection is maintained, except in case of valuable purebred animals, which must be branded and may be allowed to move on permit of state officials, to other herds where Brucella infection is known to exist.

4. All services in connection with brucellosis control to be made available to the
owner without expense to him so long as funds for such purposes are available, except for the handling of his cattle. Provision should be made if possible to pay practicing veterinarians for brucellosis eradication services on a per head and per farm basis. When state and/or federal funds are not available, it is recommended that the breeder shall continue his program at his own expense with his private veterinarian, and under the supervision of state and federal veterinarians.

5. Only vaccine approved and manufactured under license of United States Department of Agriculture, Bureau of Animal Industry, shall be used in any brucellosis control program.

6. Authorization for those engaged in the project to enter premises.

7. The official brucellosis eradication programs must be supervised by fulltime employed state and/or federal veterinarians. However, these supervising veterinarians should confer with practicing veterinarians frequently on the administrative details. Also, the number of forms and copies of reports should be kept to a minimum.

8. Permanent identification of all vaccinated cattle with tattoo “V” in the right ear, preceded by numeral of the quarter of the year and followed by the last number of the year. A calf vaccinated in December 1947 would be marked “4V7”, or hot iron brand on the right jaw, “CV” for vaccinated calves and “AV” for vaccinated adults. Special ear tags should also be used in the right ear of all vaccinated animals to aid in recognizing them.

9. A future date should be set after which no female cattle or breeding bulls more than 6 months of age shall be sold and/or moved except for slaughter, unless such (a) have been tested for brucellosis and found negative within 30 days prior to the date of sale, or

(b) are dairy cattle and breeding cattle under 24 months of age, or feeder cattle under 30 months of age and were vaccinated against brucellosis with an approved vaccine when they were not less than 6 months nor more than 8 months of age and were identified as provided in paragraph 8 and reported at the time of vaccination to state and federal cooperating agencies, excepting beef cattle in range or semi-range areas which may be vaccinated at not less than 6 months nor more than 12 months of age, or

(c) are a part of a certified brucellosis-free herd or area at the time of sale. Certified herd certificates shall be issued only by the Bureau of Animal Industry, United States Department of Agriculture, and state livestock sanitary officials, under provisions adopted by the United States Livestock Sanitary Association and approved by the Bureau of Animal Industry.

10. Legislation should be broad enough to authorize promulgation of regulations by state livestock sanitary authorities after hearings before representatives of livestock, dairy and farm organizations, public health, and veterinary medical associations. Regulations should provide for complete cooperation with local livestock and farm organizations, practicing veterinarians, the extension service, local health departments, and/or local governments. Regulations should include the following methods of procedure for eradicating brucellosis:

Plan A. Test-and-slaughter; with or without calf vaccination.

Test-and-slaughter has the advantage of being a short-time program, since many lightly infected herds may be freed and remain free of the infection after a limited
number of tests. Where negative herds are surrounded by heavy infection, the advantages of calf vaccination should be explained.

Test-and-slaughter is recommended for infected herds in which the immediate removal of reactors will not cause serious economic losses, provided owners appreciate fully the necessity of following recognized sanitary procedures. These procedures must include prompt removal of reactors, thorough cleaning and disinfection of barns or buildings in which reactors have been kept, and retests at frequent intervals not to exceed 30 days until the disease has been eradicated.

Test-and-slaughter is apt to be unsuccessful unless all of these procedures are followed. However, it has been successful in thousands of herds where suitable precautions have been observed.

Calf vaccinations should be encouraged in infected herds and areas, but shall not be a substitute for sound sanitation and management, and it should be explained that failure to follow sound management practices, so far as replacements are concerned, accounts for most of the breaks in clean herds. Owners should be warned that as is true in many other disease control programs, occasional herds do not respond satisfactorily.

Plan B. Test, calf vaccination; temporary retention of reactors until they can be disposed of for slaughter without excessive loss to the owner under provisions of the law.

The objective should be to dispose of reactors for slaughter as soon as possible. Full recognition is given to the fact that vaccinated calves will not all be resistant. However, with a high percentage of vaccinated animals having an increased resistance to brucellosis, the percentage in favor of vaccination is sufficient to support its wider use.

Plan C. Calf vaccination without test of any part of the herd.

This plan to be confined to those herds in which the movement of animals is restricted to special permits issued by State Livestock Sanitary Officials.

Plan D. Adult vaccination, only when approval is received in writing from state and federal cooperating agencies prior to the time of vaccination, which should be confined to herds where there is evidence of rapid spread of virulent infection indicating the need for emergency measures, and only after the owner has been informed in writing that the vaccinating of his adult animals may not prevent the spread of infection. In herds where adult vaccination is adopted the herd must be subjected to the agglutination test prior to vaccination, reactors identified as provided for in paragraph 3, and vaccine administered only to negative animals within 10 days after the completion of the official test.

11. Reactors will be classified as under present policies of the United States Bureau of Animal Industry, except the calves vaccinated from 6 to 8 months identified as outlined in paragraph 8, and reported at the time of vaccination to state and federal cooperating agencies; shall not be classed as reactors until after reaching the age of 30 months if retained in the herd. If moved out of the herd they shall be classed as reactors after reaching the age of 2 years. Beef cattle in range or semi-range areas vaccinated from 6 to 12 months of age will not be classed as reactors until after reaching the age of 30 months.
UNIFORM METHODS AND RULES FOR THE ESTABLISHMENT AND MAINTENANCE OF CERTIFIED BRUCELLOSIS-FREE HERDS OF CATTLE AND MODIFIED CERTIFIED AREAS

Part I

**Individual Certified Herd Plan**

Sec. 1. A "herd" shall be considered as including all animals over 6 months of age except steers, spayed heifers and officially vaccinated animals not more than 24 months of age (except vaccinates not over 30 months old with blood titer not over incomplete in 1/100 dilution).

Sec. 2. A herd may be placed under supervision, for certification as brucellosis-free, upon compliance with provisions governing the testing requirements of the respective cooperative state-federal program.

Sec. 3. Herds which have adopted practices leading to certification through the elimination of reactors, shall be retested at intervals of not more than 60 days until negative, and again within 3 to 4 months following the date of the first clean test. Such herds may be certified as brucellosis-free when they have passed at least three consecutive tests, with the first clean test and the certifying test not less than 12 months apart, provided the animals under 30 months of age vaccinated as calves shall not be required to be negative to the test.

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

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

Sec. 6. If the retest of a certified herd discloses suspects, but no reactors, herd status will be suspended pending the results of a 30 to 60 day retest of the suspect animals. If all are negative on this or subsequent retests, herd certification will be restored for a period of 12 months from the date of the last test of the herd.

Sec. 7. If any of the suspects are not available for retest, or if one reactor is disclosed through the retest of the suspect animals, the entire herd shall then be subjected to retest. A negative test will provide for reinstatement of certified herd status for a period of 12 months from the date of the last test of the herd.

Sec. 8. If more than one reactor results from any retest of a certified herd, or animals from a certified herd, the herd will be considered again in the process of certification as under Section 3.

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

Sec. 10. Additions:

1. To herds with certified status.
   (a) From other certified herds.

2. To herds in process of certification.
   (a) Additions shall be confined to animals from herds of equal or superior health status.
Sec. 11. Premises shall be cleaned and disinfected under supervision or proper direction, following removal of reacting animals.

Part II

Modified Certified Area Plan

The provisions of the individual certified herd plan that relate to testing, additions, cleaning and disinfection shall apply to the modified certified area plan.

The extent of the area shall be determined by the cooperating state and federal agencies. When an area has been designated and the required percentage of herds and cattle included under any of the plans, the area shall be placed under quarantine and the following rules shall apply: Cattle to be eligible for movement into a quarantined area must originate in a herd where control practices have been adopted under one of the plans recommended for the eradication of brucellosis. All cattle over 6 months of age, except steers, spayed heifers and cattle for immediate slaughter shall, when moved into a quarantined area, be subject to these further provisions:

Sec. 12. Cattle from officially certified brucellosis-free herds, and cattle from negative herds in modified certified brucellosis-free areas, when officially blood tested with negative results within one year of the date of shipment, may enter other modified certified areas without being retested for brucellosis. All such cattle shall be individually identified and shall be accompanied by approved certificates of health indicating herd and animal status.

Sec. 13. Cattle from herds under federal-state supervision for the control of brucellosis in which all animals in the herd over 6 months of age (except animals officially vaccinated as calves and under 30 months of age) were negative to the official blood agglutination test for brucellosis within 90 days of the date of entry, and the individual animals, subject to test, were negative to such an official test within not less than 60 days from the date of the previous herd test, may enter a modified certified brucellosis-free area or an area in the process of such certification without further test.

Sec. 14. Heifers under 24 months of age officially vaccinated as calves when 6 to 8 months of age and coming from (a) negative herds in modified certified areas, (b) individually certified brucellosis-free herds or (c) herds under federal-state supervision which have passed a test as under Section 13, may enter a modified certified brucellosis-free area or an area in the process of certification without further test when individually identified by mark, brand, tattoo or other acceptable identification, and approved by the proper sanitary official of the state of origin.

Sec. 15. Breeding cattle not over 24 months of age officially vaccinated as calves when 6 to 8 months of age, which do not qualify under Section 13, may enter a modified certified brucellosis-free area providing they do not show blood agglutination reactions higher than incomplete in dilution of 1/100 and the animals are maintained in quarantine until they have passed a negative blood test.

Sec. 16. All other male or female cattle over 6 months of age except steers, spayed heifers and cattle intended for immediate slaughter shall be required to pass a negative officially recognized blood agglutination test for brucellosis within 30 days
prior to the date of entry and shall be maintained in quarantine separate from other cattle and retested in not less than 60 days after the date of entry. If passed, they shall be released from quarantine.

Sec. 17. (a) If as a result of a test of all the cattle within an area, which are required to be tested according to the provisions of Section 1, the number of reactors (exclusive of officially vaccinated animals under 30 months of age) does not exceed 1 per cent of the cattle nor 5 per cent of the herds, the area may be declared modified certified brucellosis-free for a period of three years, provided that infected herds shall be quarantined until they have passed at least two consecutive tests not less than 60 days apart.

(b) If a test of all the cattle in an area discloses more than 1 per cent infection, the infected herds shall be quarantined and retested at periods of 30 to 60 days. If as the result of such a retest made within a period of 6 months from the date of the last area test, together with a retest of not less than 20 per cent of other representative, properly distributed herds of the area, the per cent of infection is less than 1 per cent of the cattle constituting these retests, the area may be declared modified certified brucellosis-free for a period of three years.

Sec. 18. If the results of retesting, as outlined under Section 17 (b), reveal more than 1 per cent infection, all the cattle in the area shall then be retested.

Sec. 19. At the end of the period of certification the area may be recertified for another three-year period by meeting the provisions of Section 17.

Educational Policies

Education should be promoted as follows:

All properly verified facts concerning the disease and methods of control should be kept before the public under the direction of those trained in disseminating information. This should include bulletins and leaflets more attractively illustrated, based on and confined to our present knowledge of the disease which has been properly verified by research and practical application; moving pictures; news releases; radio programs; and all known methods of publicity.

Frequent group meetings should be held for livestock owners, the meetings to be led by regularly employed state or federal and practicing veterinarians.

All properly verified useful information which becomes available through research should be disseminated, in connection with the control of brucellosis in other animals, including swine, goats and sheep.

1. Swine Brucellosis

For the past few years there has been an increasing demand for an expression from our association on this problem. Research workers from the U. S. B. A. I., land grant college experiment stations, regulatory officials, swine breeders, swine breeder organizations and others under the chairmanship of Dr. C. R. Donham, Lafayette, Indiana, submit the following report which your committee endorses and includes herewith.
Following a number of years of research with brucellosis of swine a meeting of investigators sponsored by the United States Bureau of Animal Industry was held in the spring of 1949. At this meeting it was the concensus of opinion that sufficient information is available to justify the veterinary profession to comply with requests of swine raisers for official plans for the control and eradication of this disease in swine. This group took further action and appointed a committee charged with the responsibility of preparing such a plan and instructed the committee to submit same to the chairman of the Committee on Brucellosis of the United States Livestock Sanitary Association and the Chief of the Bureau of Animal Industry for their criticism and approval. Such plans were subsequently to be submitted for the criticism and approval of the United States Livestock Sanitary Association at its annual meeting to be held in Columbus, Ohio in October, 1949, with the thought that they would be released by that body as recommendations for the control of swine brucellosis. To this end the following is submitted:

General Recommendations

Unfortunately proposals for the control of swine brucellosis cannot be substantiated by the vast experience which accompanies proposals for the control of bovine brucellosis. There are no official recommendations, rules or regulations for the control of swine brucellosis that have been tried on a statewide or nationwide basis. In fact livestock sanitarians, veterinarians and owners have been prone to ignore the effects of swine brucellosis. Interest and demand for the control of this disease of swine has only recently been forthcoming. For the most part it has not been recognized that undulant fever may be transmitted from swine as well as from infected cows. Undulant fever caused by Br. suis is now known to be one of the serious occupational hazards inherent in those occupations where direct contact between man and swine is inevitable. This disease is just now being recognized in official quarters as an occupational, compensable disease.

The diagnosis of swine brucellosis is based on the serum agglutination test similar to the diagnosis of brucellosis in cattle. In the case of swine it is generally accepted that the test is effective in determining the presence or absence of brucellosis in the herd, but has its limitations in detecting the brucellosis status of individual animals. In other words, there are some swine from which Brucella may be isolated that do not react to the blood test. Thus it becomes necessary to use the agglutination test as a herd diagnostic procedure and base any attempts to control on entire herds or units rather than on individual swine.

Another factor in diagnosis is the interpretation of the agglutination test. It is now generally considered necessary to conduct the test routinely in serum dilutions of $1, 10, 100$ and above. In the interpretation of the test results it is apparent that judgment must be used since in nearly any sizeable herd of swine, low titered reactions occur without the presence of infection and also these same low titered reactions occur in herds where infection is present. Thus as a practical rule, serum agglutination reactions at the $10$ dilution or less are considered negative unless there are definite reactors at the $100$ dilution or higher in the herd. Here again caution
should be exercised in the purchase of individual swine which exhibit a negative or low titered agglutination response unless the status of the entire herd of origin is known.

Management factors contributing to control difficulties are numerous. The large numbers of swine in a herd, the prolificacy, the community boar, the wide-spread use of the sale barn and breeding for two litters a year all have an effect on the control of brucellosis.

Specific Recommendations

Prevention: The most important preventive measure is to prohibit the introduction of infected swine into a brucellosis free herd. This is best accomplished by purchasing replacements or additions from herds known to be free of brucellosis. In the event such is not possible, each addition should be tested and no animal showing an agglutination reaction in any degree should be accepted; replacements from herds of unknown history should be kept in isolation for at least 60 days and retested before entry into clean herds is permitted. The practice of assembling a swine herd from many different sources is dangerous. It is safer to purchase fewer animals from one source if possible and thus lessen the chances of purchasing an infected hog which is not reacting to the agglutination test. Herd sires should be purchased well in advance of breeding time in order that at least two blood tests at least 60 days apart can be made on the boar prior to his use.

Community boars are not conducive to brucellosis control. The practice of loaning boars to a neighboring herd should be prohibited because of the danger of infection being spread both ways.

Show swine may spread or contract brucellosis while at fairs and shows. Such swine should be held in isolation upon their return and show a negative test before entering the main herd.

Purebred owners should be encouraged to sell breeding stock only from herds completely free of brucellosis as evidenced by entire herd tests. It is known that negative reacting groups of breeding swine from infected herds have been offered for sale. These animals may spread brucellosis although they are negative to the blood test at the time they are offered for sale.

Plans of Control

Since neither test and immediate slaughter of reactors nor vaccination have been satisfactory in the control of swine brucellosis the following two plans of control are presented for consideration:

Plan I.

Sale of Entire Herd for Slaughter

This plan is useful in herds, large or small, where the primary consideration is the production of pork. It is quick, easy and economical. An interval of 3 to 6 months may be necessary to dispose of the entire herd, feeder pigs and all, and to clean and disinfect the premises and equipment. Replacement of the infected herd should be from herds free from infection, contaminated lots should not be used for swine
again until a period of at least 90 days has elapsed from the time infected animals were removed. Periodic blood tests should be conducted on the newly purchased herd as a means of detecting infection that might be resident about the premises. Brucellosis is primarily an animal to animal contact disease, hence early detection of animals that may become infected from the premises is essential to protect the entire replacement herd.

Plan 2.

Test, Segregation and Delayed Slaughter of Infected Herd

The details of this plan are:

1. Blood test the entire breeding herd.

2. If infection is present consider the entire herd as infected rather than remove the positively reacting animals. Manage the herd as a unit.

3. Raise pigs from this infected unit. Wean and test the pigs at eight weeks of age. Isolate the negative pigs on clean premises as far removed as possible from the infected parent herd. Maintain this isolation until the infected parent herd is disposed of.

4. Blood test the pigs at 60 day intervals and immediately prior to breeding remove all animals that show a reaction of $\pm$ or above as they are found. Breed only certified brucellosis-free gilts to non-infected boars.

5. Dispose of the original infected herd as soon as suitable negative replacements are available or as soon as it is obvious that the plan is giving satisfactory results.

6. Premises where the infected herd was kept should be cleaned and disinfected thoroughly prior to admission of the clean replacement herd and allowed to remain idle for at least 90 days.

This plan provides for the raising of negative pigs from the infected parent breeding stock in such a manner that clean replacements of known blood lines are available. Ultimate disposal to slaughter of the original infected herd is necessary, but is delayed until the quality, quantity and the disease status of the pigs is known. This plan avoids the necessity of purchasing replacements from unknown sources and also aids the breeder in maintaining desirable blood lines.

Plan 2 has been used under experimental field conditions and has worked. It is the method of choice for purebred herds or in herds where improved blood lines have been developed even if the ultimate objective of the owner is pork production rather than the sale of breeding stock.

The time of disposition of the infected herd will depend upon whether the "one litter" or "two litter" system is employed. Naturally the "two litter" system will be more difficult since numbers of swine alone will tend to complicate control. A decrease in numbers of breeding swine is advisable in Plan 2. In either the one or two litter system it is necessary to maintain complete, permanent segregation of the infected parent swine from the weaned and tested offspring.

Plan 2 does not necessitate complete cessation of swine production at any time during the operation of the plan, but the chances of success are enhanced if the size of the herd is reduced during the period of segregation.
Plan of Agreement

1. A herd may be designated as certified brucellosis-free when it has passed two successive negative agglutination tests conducted 60 days apart and a final retest at the end of six months at which times there are no agglutination reactions at \( r_i \) or over.

2. A certificate to this effect will be issued to the owner by the official animal disease control agency of the state and shall be valid for a period of 6 months from date of issue. Certificate renewable on a subsequent negative test after 6 months.

3. Blood samples are to be taken by an accredited and approved veterinarian and shall be submitted for the official agglutination test. The tests shall include all swine over six months of age.

4. All animals shall be properly identified in a manner satisfactory to the official animal disease control agency of the state. In the interest of permanency, ear tattoos or notches are recommended in addition to ear tags.

5. Replacement breeding swine procured directly from certified brucellosis free herds may be added to the herd without additional tests. All other replacement breeding animals shall be accompanied by a certificate showing them to have passed a negative agglutination test and thereafter shall be isolated from the remainder of the herd until they have passed a second negative blood agglutination test for brucellosis. Such retests are to be made not less than sixty days after arrival on the premises. Bred gilts and sows from non-certified herds should be isolated until they have farrowed and are found to be negative to a post-farrowing blood agglutination test.

6. When replacement breeding animals are added to a certified brucellosis-free herd, the official animal disease control agency of the state shall be notified in writing. Such notification shall include the number and class of animals purchased, name of seller and acceptable identification of the individual animals involved.

7. Owners shall not allow the use of any biological product for the prevention or treatment of brucellosis in the herd, unless authorized by the official animal disease control agency of the state.

8. Reacting swine shall not be disposed of for purposes other than immediate slaughter.

9. In consideration of assistance rendered by the official animal disease control agency of the state, the owner agrees to undertake the eradication of swine brucellosis and to maintain a certified brucellosis-free herd in accordance with one of the foregoing plans.

ABR (RING) TEST

Field experience with the ABR (ring) test of milk and cream in Ohio and Minnesota indicates this technique may have great possibilities as a weapon in brucellosis area control programs. Your committee urges that its potentialities be further investigated. Your committee further urges the U. S. B.A.I. develop a standard ring test antigen and to prevent misuse, to rigidly control its distribution through official channels only.
National Brucellosis Committee

Your committee wishes to endorse the educational, research and promotional activities of the National Brucellosis Committee and greatly appreciates their interest and support.

A.V.M.A. Committee on Practitioner Participation in Brucellosis Eradication

Representatives of this committee met with and made suggestions to your brucellosis committee. We appreciate their interest and we again urge maximum cooperation between local practitioners and official control agencies.

New Vaccines

It is well known that present day vaccines have limitations in their usefulness. Your committee urges research to attempt the development of improved vaccines.
SUGGESTIONS FOR REDUCING THE INCIDENCE OF PROBLEM HERDS IN THE T. B. ERADICATION PROGRAM AND RECOMMENDATIONS FOR HANDLING THEM

JACOB TRAUM, D. V. N.

Department of Veterinary Science, University of California, Berkeley, California

Before I was officially invited by your Committee to present a paper at this meeting, I was warned of this impending invitation. I discussed it with my colleagues in California and in Washington, and frankly, I hesitated to accept. I pointed out and named men in and out of this organization who could give you more and present it better than I can. I believe the Committee picked on me because of my long and deep concern and interest in the tuberculosis problems, because they knew I would finally say "yes" despite the fact that I am old enough "to know better" and perhaps I should have said "no".

The two most difficult problems in the present stage of the tuberculosis eradication program have been discussed and presented to you at various times to us these problems are (1) No visible lesion reactors (NVL), and, (2) The appearance and the increase of tuberculosis herds in some areas. For a period, the NVL problem received considerable attention, and while it has not as yet been satisfactorily solved, and remains an important problem, it hasn't been as much in the lime-light recently as the problem of the tuberculous herd. In many respects, the NVL has been responsible for the appearance and the spread of tuberculosis in some herds. The increase of tuberculosis on the whole is not very alarming, but appreciable nevertheless; and is especially a troublesome factor in the milk sheds of some of our larger cities. To a great extent, those problems are inter-related; because as you realize that if every cow or even a high percentage of cows which reacted to the tuberculin test would be tuberculous, the infected herd would give us little trouble and we would readily find methods of bringing such cases down to a minimum. We would not hesitate to pick reactors. We would not be too late in bringing into play all methods that are available to induce reactions even in the tuberculous cow of low tuberculin sensitivity. We have such methods.

committees and reporters at your meetings for the past several years.

One could take the proceedings of this association for the past five years and abstract or quote directly from the reports of your committees on tuberculosis, from B.A.I. reports and from the papers by Zeissig, Johnson, Moore, Kuttler and others and one would then have all and more than will be presented to you in this paper. These reports and articles are, therefore, recommended as essential reading and reference to those concerned in the tuberculosis eradication program. Warnings and suggestions have been made. Nevertheless, there are those among us who believe that the suggestions could stand and merit repetition, especially is that impressed upon those of us who have recently been confronted with the problems. It can, therefore, be seen that a presentation of this subject can hardly be made without repeating to a great extent what has already been given you. There are many ques-
tions in connection with these problems for which a solution or answer has not as yet been found. There is, however, sufficient information at hand if taken into consideration that would reduce these problems to a greater extent than is now being done.

Practically every discussion on these problems calls to your attention the outstanding attainments in the U. S. in bringing the country as a whole to a point where we have less than 0.2% tuberculosis in our cattle. No nation where livestock is of any consequence at all, can anywhere nearly approach that figure and this presentation cannot begin without calling your attention to the statistical report which has been made available to all of you at this meeting by the Tuberculosis Eradication Division of the United States Bureau of Animal Industry, which shows that the lowest figure for reactors was reached in 1943 when it was .18%. Then there was a rise, which in 1945 reached .24% and it was not until 1948 that it again fell below .2%, to be correct .19% and the same figure holds good for 1949. There is really no real cause for alarm, but there is plenty of reason not to become too complacent about the situation, and it was this complacency that was most feared and has therefore been brought to your attention in the various reports to this association. The figures of a low over-all percentage of reactors is supported by the post-mortem findings obtained from federal meat inspection records which show in the statistical tables that there has been no appreciable increase in the percentage of carcasses retained and in carcasses sterilized. This gives us a feeling that perhaps the reports of your committees and the warnings by your reporters have had some effect, and there is not as much complacency and smug feeling that there was several years ago and that there has been a real danger has been recognized.

You will recall that your Committee's report under the chairmanship of W. A. Hagan given at your meeting in 1946 was so severe in its language that after it had been accepted by the association your executive board sent it back to the Committee for alteration. Despite the severe language in this report, the Bureau of Animal Industry has found it important enough to have mimeographed copies of this report made available to all of its employees engaged in tuberculosis eradication program. This was reported to you by Kuttler in his paper in 1947.

Above, it was stated that it would be very difficult to present these problems without repeating what in substance has already been reported to you and I will begin by quoting from one of Zeissig's paper. "There are three factors which play a part in the tuberculin test, the man, the tuberculin, and the cow, and I would add a fourth, the owner-veterinarian relationship." The treatment of these factors separately should facilitate the presentation of the many sided phases to these problems.

As expressed by Zeissig and as known to most of us who have been actively doing testing and have been in consultation with those that have been doing testing, that the veterinarian making the tests has the least effect upon the resulting reaction, unless it be by gross carelessness or utter neglect on his part. This has happened, but fortunately only rarely. All of us appreciate the desirability and advantage of doing as good a job as possibly can be done, but we have purposely, for the sake of information, made injections of tuberculin which were made not according to the recommended procedures and the results were not too aberrant, and would not have gotten us into problem herds. On the other hand—conscientious, experienced, and
careful veterinarians have encountered problem herds in their districts and they have frequently found themselves in unpleasant positions. Everyone who has given this any thought whatsoever realizes that if we had better tools than available at present, we would readily solve these problems and the little setbacks that we might have been caused by carelessness or inability on the part of veterinarians would readily be overcome.

The tuberculin, the other factor, concerned has received considerable attention and study. Koch, the discoverer of tuberculin appreciated the shortcomings of his product and he and his associates made many efforts to refine and improve his tuberculin. It is no doubt known to most of us that very early in the manufacture of tuberculin by the Bureau of Animal Industry, those in charge of the production and use of tuberculin realized the need of a better tuberculin and they have constantly been on the alert to make improvements which would eliminate the undesirable features and increase the efficiency of the tuberculin tests. You will recall that there has been a change by the Bureau of Animal Industry from the old beef broth to a synthetic medium upon which the tubercule bacilli are grown for the production of tuberculin. This change is generally accepted as a vast improvement, especially in obtaining a greater yield and in reducing the non-specific or perhaps better stated, the mechanical reactions that were encountered with the older tuberculin. Biochemists, chemists, physicists, specialists in the field of allergy are at work in an attempt to make tuberculin more specific and more sensitive. Several times, trials of considerable extent in the laboratories and experiment station of the B.A.I. at Washington and at Beltsville have indicated that a fraction of the tuberculin has been found that would either induce more and stronger reactions in the tuberculous animal and fewer and weaker reactions or no reactions at all in the non-tuberculous cow. But on further trials, both in the laboratories and in the field, these fractions did not come up to their earlier performance. The search for better tuberculin is still going on and in fact more so than ever at this time, applying the newer knowledge in the chemical, physical and biologic sciences.

When the PPD (purified protein derivities) tuberculin was brought out by Florence Seibert, it was hoped that this would in a great measure reduce the non-specific reactions and increase the sensitivity of the specific reactions in cattle testing. Here again, field trials, not only in this country but field trials on a very large scale in Europe, especially in England, have failed sufficiently to meet that expectation to warrant its substitution for our present O. T. tuberculin.

The writer had the good fortune recently to spend a portion of an afternoon with H. H. Green of the British Ministry of Agriculture who has concerned himself for many years in the Weybridge Laboratories with the studies of tuberculin and especially with its purification, and at this time, the laboratory at Weybridge produces more PPD than any other institution in the world. He left the impression with me which is well stated in one of his articles.1

1 Relative potencies of officially recognized tuberculins—Although P.P.D. tuberculins are cleaner products which can be issued at precise strength on a gravimetric basis, or as analytically checked solutions of any selected potency, and are, there-
fore, preferable to H.C.S.M. products standardised only on a biological basis with a much larger margin of error (+40 per cent. in an 8 guinea-pig test as compared with +0.5 per cent. on a chemical analysis), the real difference in practical use at high dilutions is the Mantoux test in the human subject, or at neat O.T. strength in the intradermal test on cattle, is not very great. Because of the removal of evaporated media constituents and alien metabolic products of bacterial growth from O.T. types of tuberculins, P.P.D. tuberculins tend to give more uniform reactions in tuberculous subjects, but the practical difference in diagnosis is not great and there is no fundamental objection to continued use of O.T. tuberculins."

We, therefore, see that so far as available we now have as good a tuberculins as we or anybody else in the world has been able to produce for the testing of cattle.

The third, and the most uncontrollable factor, the cow; it is the animal's state or lack of sensitivity to tuberculin that makes, for the most part, these problem herds. While this factor cannot be controlled, the work of the Bureau of Animal Industry by H. W. Johnson and his colleagues, have pointed out that certain areas of the skin of the cow are more sensitive to tuberculin, while others are less sensitive, and that between are areas of moderate sensitivity. The application of this information should be of considerable help in reducing and handling our problem herds.

They have also evidence to show that local desensitization follows the intradermal injection of tuberculin, and the weak reaction induces a longer period of desensitization than a strong reaction, suggesting the use a previously unused injection sites in retesting cattle. Your proceedings contain more information on the relation of sensitivity of cattle to tuberculin.

The fourth factor, that is, the dairyman-veterinarian relationship, deserves considerable attention. The writer was one of a group who early in the tuberculosis eradication program in California did not officially declare many animals as reactors that showed response to tuberculin which definitely came within the range of reactions. We did that for several years, at least ten, on thousands of animals tested. We, of course, took the herd history and individual animal history into account. The herd owner or manager was advised of the findings and shown the reactions and was told that in our opinion these animals were not tuberculous, but we could not be sure and we might even be mistaken, but if he was willing to share the responsibility, we would leave them in the herd. We however insisted on sampling the reactors and would brand from 5-10 out of a possible 50-100 deviators. The animals to be branded were selected on history, the size and kind of the reaction, and the responses to supplementary tests, and were those which we thought the most likely to show tuberculosis of any of the deviators. If, in any such animals tuberculosis was found, the remainder of the reactors were also autopsied. These herds ranged from 200-1500 milking cows and the tests were made semi-annually.

Dairymen are confused to find that at one test animals showing small deviations are condemned as reactors while other animals with large tuberculin reactions are left in the herd, or that in his herd the interpretations of the test was entirely different than those made on his neighbors or brother-in-law's dairy.

In most cases, at least in our experience, the veterinarian and test fare better when the situation is explained to the dairyman.

It is desirable at this time to call attention to a feature in the tuberculin testing
campaign which has existed in parts, unfortunately not in the entire state of California, and this consists of regular weekly conferences of the staff that were doing tuberculin testing. At these conferences the men bring their field books to the office which contain a complete record of every deviation no matter how small of every animal in the herd. The supervising inspector has the post-mortem reports received during the week on the reactors sent to slaughter. These are discussed. If an unusual occurrence happened during the week, it would be reported and discussed. Consultation and frank discussions take place at such meetings. This sort of development is now taking place in several of the other parts of the country, notably in New York State, and it is the opinion of many of us that this feature is essential in any eradication or control program, especially where problem herds are involved. Recently, there have been tests performed in New York State in which state and federal bureaus participated. After testing the problem herds, the findings in each herd were reviewed and a recommendation made for each herd. Such procedures are bound to result in better handling and reducing the problem herds.

The amount of valuable information which can be obtained from records kept by veterinarians, filed and discussed at such meetings are impressive. In the group in the Bay area around San Francisco has been under the supervision of Dr. R. E. Duckworth who compiled data in which the writer was interested and which several years ago was submitted to the U. S. Bureau of Animal Industry and is considered by the Bureau as extremely valuable field data.

There are conditions in California and perhaps in other milk sheds of our other large cities that present almost unsurmountable problems, especially where there is tuberculosis of any extent, either present in the herd or in the herds from which replacements are made, or in their neighbor's herd. I have reference to an appreciable number of dairies of considerable size, 100–500 or more milking cows, where practically every replacement is purchased and where the premises upon which the cows are kept are limited in size with limited or no pasture facilities. It was in such herds that recently we had breaks of considerable magnitude in California. And in two of such herds, it was necessary to begin afresh and start a new herd. California is not alone in such instances.

Some public health officials have been very much concerned in some sections where severe breaks have occurred and where attempts to salvage the herd from complete involvement with tuberculosis was started too late and was not or could not be accomplished. In such cases it has been suggested, sometimes only strongly hinted—(I hesitate to mention it)—It has been suggested that replacements and non-reacting cattle in such herds or in herds under similar condition be vaccinated with B.C.G. Imagine what that would do to a tuberculin testing program.

It was thought that in this presentation there would be included specific suggestions on methods of procedure in handling the variety of conditions which may be involved in dealing with problem herds. But in order to do that, it would be necessary to refer to the reports and papers already mentioned in this presentation.

The suggestions of Zeissig in detecting the spreader animals by the long subcutaneous test, animals which so often fail to react to the routine intradermal testing or the suggestions by Johnson in handling the same situations by cervical injections could be discussed. The report of Zeissig where he finds, as others have found that
many of the N.V.L. reactions are transient and decreased or subside or disappear entirely on retest could be detailed. The various reports of the Tuberculosis Eradication Division of the Bureau of Animal Industry could be referred to. The excellent paper read by E. V. Moore in 1947 of the work in New York State, where he gives specific recommendations for the handling of the various cases of problem herds could be repeated. As stated these are already part of the proceedings of this association for the past few years and instead of quoting from the article of these men, it is again urged that the reports and papers of this association dealing with the tuberculosis eradication problem be consulted for guidance in preventing the occurrence and the handling of problem herds.
DISCUSSION

Mr. H. R. Smith

Chicago, Illinois

I want to call your attention to the problem herd. Have we reached the irreducible minimum in the eradication of tuberculosis? I think from 1917 to 1947, there was a reduction in condemnations on all cattle slaughtered in the United States, exclusive of reactors, of 98.6 percent. That is significant because it shows that the poultry problem is not a factor in causing lesions in cattle, that is observable lesions under inspection.

That is not true in hogs. We have trouble with the avian tuberculosis in hogs. While there has been a reduction in retentions in cattle of 98 percent, there has been only a reduction of 90 percent in hog retentions.

I remember pointing this out at the National Convention of the A.V.M.A. in 1921, the increase in the retentions of hogs and the decrease at the same time in the condemnations in cattle shows conclusively from 1917 to 1924 the increase in the prevalence of tuberculosis in poultry which caused a high increase in the retentions in hogs, but not condemnations.

Dr. Scholar made the remark that 95 percent of the T.B. in hogs came from cattle. That was true as far as condemnations were concerned, but the retentions were caused in large part by poultry.

Those retentions are now decreasing rapidly, due to the increased practice of disposing of all birds at the end of the first laying season, and retentions due to tuberculosis going down rapidly now.

A few years ago in 1924 we had 15.2 percent, retained. Now it is down to 5.5 percent in all hogs slaughtered in the United States. That is retentions.

There is one thing I want to add. While there has been a reduction of 98.6 percent in all cattle slaughtered exclusive of reactors, if we count the reactors there has been a reduction of 97.7 percent. When you include the reactors, there is still a reduction of 97.7 percent. If we include calves, it is above 98 percent. I will say that you are safe in saying since the campaign was started in 1917, there has been a reduction in cattle condemnations and cattle retentions of 98 percent. That shows the remarkable work that the people have done in testing cattle throughout the United States.

These problem herds are something we have got to give attention to. As I said, there has been no reduction in retention and condemnation from tuberculosis in cattle since 1947. Have we reached the irreducible minimum?

We have this to think about. There is some transmission from people to cattle. You perhaps read that article written by Dr. Meyer of the University of Minnesota Medical College, in which he calls attention to that. I have reprints of this article. If any of you wish a copy, write me and I will be glad to send you a reprint. It may be that we will have to put our shoulders behind the human tuberculosis problem in order to remove the cause in cattle. That may be true because I am inclined to think that that is one reason why there has been no decrease since 1947.
DISCUSSION

Now, the problem herd—I just want to take one more minute. I have in mind a number of problem herds. I know of one herd in which I want to emphasize strongly the importance of applying the re-test within 30 or 60 days after the test disclosing reaction. The re-test should be applied promptly. In this case, there were 65 high grade Holstein cattle tested on December 2, 1946. One reacted. They were not again re-tested until six months later when 31 cattle reacted. They must have overlooked something in that first test, perhaps one or more were immune or something like that.

They were again tested four months later and nine reacted. They were tested again November, 1946, and sixteen reacted. They were tested in February, 1948, and none reacted. Tested again in May, 1948, and none reacted. They were tested again September, 1948, and one reacted. They were tested again February 1949, one reacted. Alltogether fifty-nine reactors were taken out of that herd.

Of course, there were many purchased replacements during that period, but they were kept on another farm where there were no reactors. This man lost, he told me, a total of approximately $15,000. There is a real problem herd and I just want to emphasize here how important it is to re-test infected herds promptly because in this case I am sure if they had been re-tested more promptly, there wouldn’t have been that terrific loss.

I just want to close by saying I want to compliment the veterinarians of the United States for their remarkable accomplishment. The overall reduction has been remarkable and you deserve all the compliments for the wonderful work you have done to make it as thorough as it has been.

We have reached that stage where we ask the question: Have we reached the irreducible minimum? It makes it important to conduct these re-tests promptly.
REPORT ON BOVINE, AVIAN AND SWINE TUBERCULOSIS

BY ASA WINTER, D.V.M.¹

Recent reports to this Association on The tuberculosis Eradication Project have provided a fairly clear picture of accomplishment in this connection, and also the continuing problems. These previous reports have described, in considerable detail, those factors which must still be considered as limitations to the program of final eradication. Because of this, and to avoid repetition, the 1949 report will be quite brief, and your attention is invited especially to the 1948 report on this subject for any additional information which may not be included here.

From its inception, the tuberculin testing program was advanced as the tool for eventual eradication of this disease. While accreditation of all states in 1940 as modified tuberculosis-free areas was justly a commemorable milestone in our years of effort, we should look on that date only as a breathing point in preparation for the grind to further reduce that low minimum of infection, in accomplishing total eradication.

It was quite natural that the attack would lose some of its vigor following completion of the race between states for modification. And, also, with modification of all areas, a psychology developed with many individuals that bovine tuberculosis should be written off as a disease of minor future consideration. These conditions and also some overlapping with the growing brucellosis program during the years immediately preceding 1940, and since, have created concern whether the low incidence of tuberculosis can be further reduced or even maintained. A slight rise in reported infection over the 1943 all-time low has been responsible for this situation.

The testing records since 1940 have been carefully studied together with a review of the more recently testing techniques, and also the changing psychology with respect to the problem, in an effort to better evaluate the trend of the past few years and what may reasonably be expected from this point on.

The table included with this report has provided statistical material of value for this study. It will be noted that the total reactor percentage continued to drop from the 1940 accreditation figure of .46% to a low of .18% in 1943, a very rapid and satisfactory decline. As would be expected, this very low incidence of reported infection (.18% or a ratio of 1 reactor to 542 animals tested) offered a real challenge to maintain under the wartime stress for meat and dairy products at any price, and the limitation of veterinary and agricultural manpower. The result was a slight increase during the 1944 year and a greater increase during the following year. From 1946 on, the trend has reversed favorably and the 1948 and 1949 figures show a fixed incidence of .19% infection (within .01% of the 1943 low point). These data indicate what can happen, and how rapidly, if the potentials of this disease are not fully

¹Dr. Winter is Assistant in Charge of the Tuberculosis Eradication Division, Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.
appreciated, and concerted intelligent effort is not applied toward its complete eradication.

It is believed adoption of the 1948 recommendations of the committee on tuberculosis of this Association, requiring a lower incidence of infection for remodification of areas, would favor more rapid eradication of the disease.

One of the much discussed questions in connection with this program has been the no-visible-lesion reactor. Since those factors responsible for non-specific reactions tend to remain fairly constant, the reverse ratio of no-visible-lesion cases, to total reactors, is a condition that must be expected with the decline in rate of infection. This has become an increasingly sensitive subject and one that demands continued study.

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<td>18,338</td>
<td>0.2</td>
<td>1-485</td>
<td>6,623</td>
<td>37.3</td>
<td>.074</td>
<td>1-1345</td>
</tr>
<tr>
<td>1945</td>
<td>8,105,480</td>
<td>19,534</td>
<td>0.24</td>
<td>1-416</td>
<td>5,926</td>
<td>31.3</td>
<td>.073</td>
<td>1-1369</td>
</tr>
<tr>
<td>1946</td>
<td>8,454,463</td>
<td>19,464</td>
<td>0.23</td>
<td>1-436</td>
<td>7,739</td>
<td>39.2</td>
<td>.091</td>
<td>1-1094</td>
</tr>
<tr>
<td>1947</td>
<td>8,312,919</td>
<td>16,666</td>
<td>0.2</td>
<td>1-500</td>
<td>6,832</td>
<td>40.4</td>
<td>.082</td>
<td>1-1218</td>
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<tr>
<td>1948</td>
<td>8,294,423</td>
<td>15,943</td>
<td>0.19</td>
<td>1-522</td>
<td>7,544</td>
<td>46.8</td>
<td>.09</td>
<td>1-1101</td>
</tr>
<tr>
<td>1949</td>
<td>8,737,501</td>
<td>17,007</td>
<td>0.19</td>
<td>1-514</td>
<td>7,708</td>
<td>45.9</td>
<td>.088</td>
<td>1-1133</td>
</tr>
</tbody>
</table>

The per cent of no-visible-lesion cases, when considered in relation to the total animals tested, does, however, show a steady decline from the peak testing year of 1935, through 1943, with a fairly stable figure since that date of less than one-half the percentage recorded at the time of nationwide modification. In connection with this study a further refined tuberculin which under experiment has exhibited properties of greater specificity, is now under field demonstration trials. It is expected to extend its use in this manner until sufficient data has been accumulated from different areas to give proper evaluation to the product. This field study will also include efforts to further standardize the application and interpretation of the cervical test which is proving an effective practice for use in herds where eradication of the disease continues to present a problem.

While the no-visible-lesion reactor presents an embarrassing and costly problem, with research being directed toward its solution, the question of locating remnant sources of exposure is of much greater importance as a disease eradication factor.
It is expected that any improvement in tuberculin, which will reflect favorably on
the no-visible-lesion problem, may also aid in detecting infected animals not respond-
ing to present routine testing practices.

A close working arrangement between veterinarians of the Meat Inspection and
Stockyards Inspection Services, with respect to the reporting of tuberculous infection
revealed in non-reacting animals, has resulted in uncovering many sources of herd
infection not detected through regular testing. This is proving a most important aid
to the Eradication Program.

Avian tuberculosis surveys are being continued in 11 Midwestern States with,
in one area, all cases of swine which show lesions of tuberculosis upon slaughter in
federal establishments being reported back to the states for field investigation.

Tuberculin tests of all livestock on these premises are being conducted with a
view to establishing additional information on the extent and transmission of avian
tuberculosis as a contributing factor to the no-visible-lesion problem in cattle.

Research on paratuberculosis being conducted at the Auburn Regional Laboratory
and described in the 1948 report has been continued. The results of this work when
completed will be of benefit both in the control of the specific disease and as further
information on the relationship of reactions elicited to this disease as they may affect
the tuberculin testing program.

With the decline in tuberculous reactors it has become difficult to provide ma-
terial for student demonstration purposes and, as a consequence, many of the
younger accredited veterinarians have not had an opportunity to become familiar
with the disease or interpretation of test results. It is probably more important than
ever that present day field operators should be especially well trained in these
responsibilities and cooperating agencies are working closely with the Bureau to
overcome the situation which this presents. Veterinary colleges recognize the prob-
lem and several have indicated that steps are being taken to provide additional
instruction in this regard.

As an aid in this effort, it has been suggested that when tuberculous reactors are
congregated for slaughter at an establishment within reach of any veterinary college,
arrangements should be made, if possible, to hold these animals for retest by senior
veterinary students and also for observation of post-mortem findings. This practice
has been followed in a limited way and is proving very satisfactory.

Alternative arrangements can be made to route tuberculous reactors through
veterinary clinics for demonstration testing and slaughter under inspection by
federal veterinarians at the point, or later at a federally inspected establishment.
In those cases where neither of these courses are possible, healthy animals can be
sensitized for clinical tests and study, although the reactions under these conditions
will follow more closely the classical type and not provide the variable picture so
commonly met with in regular work. Efforts are also being made by Bureau veter-
inarians to demonstrate field reactions to interested accredited veterinarians when
located within their territories.

The veterinary student trainee program instituted by the Bureau provides an
opportunity for veterinary students who have completed the third year of college
to work with Bureau veterinarians and observe the technique and results of regular
field testing. The services of these men have been indicated by the supervising veter-
inarians as generally very satisfactory, and it is believed the training in this capacity will be of real benefit to the students, and the Bureau, in their future role of cooperating accredited veterinarians.

While improvements of these factors will all contribute to a more successful future for the program, probably the one most important influence in this direction will be a greater appreciation of bovine tuberculosis, as a continuing menace, by all concerned with the eradication of the disease. There is reason to believe this is becoming understood. If this recognition has become a fact, through the unfavorable tuberculosis situation of the past few years, the price paid can be justified.

In conclusion, it is urged that we all recognize bovine tuberculosis as a continuing problem of sizeable proportion, but that the records show progress in stemming the recent unfavorable tide, and that improvement in practices and thinking are paving the way for further reduction in the present low incidence of infection. It should be appreciated, too, that complacency must never again enter the picture and that full effort will be needed if we are to continue through to eradication.

Statistical data which cover the period of the bovine tuberculosis eradication project have been prepared by the Bureau and are available here at the speaker's desk or may be obtained by writing to the Bureau.
Bovine tuberculosis still exists in the United States. While the incidence has been greatly reduced since the control program by the Bureau of Animal Industry of the United States Department of Agriculture and the several states was first initiated, this disease still remains in isolated centers in a sufficient amount to constitute a potential menace to the livestock industry and the public health. It is feared that many livestock sanitarians have been lulled into a spirit of complacency in regard to tuberculosis which is not justified by the facts. Only by constant vigilence and continuation of energetic and systematic programs to seek out and destroy the remaining centers of infection, can we be assured that this treacherous enemy will not rapidly increase and assume the proportions existing before national control was instituted, thereby resulting in a waste of all the effort and money expended in bringing the disease to its present low incidence.

Your Committee desires to reiterate the statement in the 1948 report that "all those in charge of this work should be more concerned with tuberculosis eradication than the reaccreditation of areas as such." Reaccreditation is important in order to assure the livestock breeder that cattle purchased from any certain area, will in all probability be free from exposure to tuberculosis. Every state must guard its accreditation zealously in order that the livestock industry may maintain a favorable market and to give the cattle breeders of the state proper credit for their efforts toward eradication. Under no circumstances should our efforts cease on attaining accreditation, nor until we have determined by repeated tests that the last center of infection has been sought out and destroyed. Furthermore in all justice to other states, no area should be declared modified accredited until or unless all reasonable measures have been taken to determine that the incidence of tuberculosis within such area is in fact less than the maximum provided for reaccreditation.

During recent years there has been a growing tendency to discount the accuracy of the tuberculin test. True, the percentage of "no lesion" reactors is significant and must be considered. This per cent, will of course, increase as the incidence of tuberculosis decreases. We must realize, however, that so-called "no lesion reactors" are not all free from tuberculosis. Therefore, such animals can not be safely disregarded. On the other hand, judgment in interpreting the tuberculin reaction must be exercised if many non-diseased animals are not to be sacrificed. Your Committee believes that any animal disclosing a slight or non-typical reaction in an otherwise negative herd, should be classified as a "suspect." The term "suspect" clearly implies suspicion that tuberculosis may exist. It emphasizes the importance of restricting the
movement and transfer of animals from herds in which such suspects are disclosed until retests have been conducted and the status of such animals clearly determined.

This Association at Chicago in 1947, adopted a report of this Committee recommending that before January 1, 1951, the Uniform Methods and Rules be amended to provide that all cattle in an area shall be tuberculin tested at intervals not to exceed six years before accreditation or reaccreditation after that date. In Denver in 1948, the Committee included in its report recommendations for changes in the Uniform Methods and Rules which would in effect be a complete revision. Their adoption would result in somewhat different approach to the tuberculosis eradication problem from that provided by the Methods and Rules now in effect. In certain respects the suggested amendments were directly contrary to the action adopted by the Association in 1947. The 1948 Committee wisely suggested careful consideration of the proposed changes which were suggested in the annual report of the Association, and recommended deferring action until this, the 1949 meeting.

Because of the conflicting recommendations of the reports of the 1947 and 1948 Committees, and because of the extensive amendments involved, and at the suggestion of Dr. B. T. Simms, Chief of the Bureau of Animal Industry, the Chairman of your Committee sent a questionnaire to all State Veterinarians and State Inspectors In Charge for the Bureau, requesting their opinions on the proposed changes. Replies were extremely variable and indicated a wide difference of opinion relative to the advisability of the suggested changes. After careful study of the proposed changes, your Committee recommends the adoption of the following Uniform Methods and Rules, which includes, as far as possible, the changes strongly favored by the state and federal officials of the several states, but does not include those changes recommended by the previous committees which were not endorsed by a definite majority of those to whom the questionnaire was submitted.

**Uniform Methods and Rules for the Establishment and Maintenance of Tuberculosis-Free Accredited Herds of Cattle and Modified Accredited Areas**

**Part I.**

**Individual Accredited Herd Plan**

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

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

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

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

(3) The accredited veterinarian shall submit a report of such tests in accord-
ance with the regulations of the cooperating state and federal authorities. These offi-
cials reserve the right to supervise any tests conducted by an accredited veterin-
arian.

2. The Tuberculin Test:

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

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

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

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

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

5. Reactors to the tuberculin test shall be promptly removed from the farm, and,
after their removal, the infected premises shall be thoroughly cleaned and disinf-
ected with a disinfectant approved by the U.S. Bureau of Animal Industry, and
in a manner satisfactory to the cooperating state and federal authorities. The fol-
lowing information should be included in the report of the veterinarian making
the test:

Past history of herd
Water supply
Light
Ventilation
Sanitation
Management
Manner of making additions to the herd
a—source, b—isolation pending retest, c—retests

Disposal of waste products
Human infections
Avian infection

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

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

8. Herd Records:
   (a) The herd owner is required to establish satisfactory evidence of the identity of each registered or grade animal, the grade animal to be marked by a tag or other marking satisfactory to the cooperating state and federal authorities.
   (b) Each herd owner is required to keep a record of all additions and removals of cattle from the herd by sale, death, or slaughter.

9. All vehicles shall be cleaned and disinfected before they are used for transporting cattle to herds maintained under this plan.

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

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

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

Part II

Modified Accredited Area Plan

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

14. If, as the result of one complete tuberculin test within the designated area, the total number of reactors is less than one-half (½) of one (1) per cent of all the cattle within the area,* the area shall then be declared an official modified tuberculosis-free accredited area for a period of 3 years by the cooperating state and federal officials. Infected herds shall be quarantined and retested. If the total number of reactors found as a result of this retest within the area is less than one-half (½) of one (1) per cent of the entire cattle population within the area, the area shall

* except as hereinafter provided in paragraph 23.
then be declared an official modified accredited area for a period of 3 years. All infected herds shall be quarantined and tested as provided in paragraph 1.

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

17. (a) Modified accredited areas, in which a complete area retest of all the cattle in said area indicates a degree of infection not exceeding two-tenths (0.2) of one (1) per cent, may remain in the modified accredited status for a period of 6 years from date of reaccreditation, provided that all infected herds shall be quarantined and tested as provided in paragraph 1.

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

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

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

21. After January 1, 1951, no modified accredited area excepting those located in range or semi-range areas shall be reaccredited unless all of the cattle in said area have been retested within 6 years prior to date of reaccreditation and the percentage of infection disclosed is less than one-half (½) of one (1) per cent.

22. No-visible-lesion reactors found in herds where no lesions of tuberculosis are found in any of the reactors, and no history or other evidence of infection is found, will not be counted in determining the percentage of infection as provided in section 13 to 23 inclusive. No-visible-lesion reactors will be counted when found in herds where any lesion reactors are found, or in herds where lesions of tuberculosis have been found on post-mortem meat inspection reports.

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

(a) When all bulls, purebred breeding cattle, milk cows, at least 10 per cent of *except as hereinafter provided in paragraph 23.
the semi-range breeding females, and such other cattle as may be considered necessary by the State and Federal Department cooperating are tuberculin tested.

(b) When all bulls, purebred breeding cattle, milk cows, barnyard cows, and home fed cattle are tuberculin tested, and properly identified post-mortem reports are produced showing that at least 10 per cent and not less than 25 animals of the breeding herd have been slaughtered within a year, and that such post-mortem examination failed to disclose lesions of tuberculosis.

If, under paragraph (a) or (b) of this section, a reactor or any other evidence of infection is revealed in any herd by post-mortem reports, etc., including post-mortem inspection at packing plants of those branded cattle that are sold direct from the range for immediate slaughter, then all of the cattle in that herd or associated with the disease animal shall be immediately tuberculin tested in accordance with the provisions of the Modified Accredited Area Plan. The area may then become a modified accredited area, and be reaccredited at the expiration of three years, if the total number of reactors and cattle found tuberculous upon post-mortem examination from the area is not more than one-half (½) of one (1) per cent of all the cattle tested in the area.

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

The Bureau of Animal Industry of the United States Department of Agriculture has recently suggested that when testing cattle for tuberculosis at public stock yards, the time between the injection of tuberculin and the observation of the reaction be shortened from 72 hours to 48 hours. They further stated that this change shall not apply to tuberculin testing in general, but only to the testing under stock yards conditions.

Your Committee is not aware of any changes in the tuberculin now produced which would justify shortening the period between injection and observation. It has been generally conceded and proven beyond question in actual field testing, that in the majority of cases the tuberculin reaction is at its height in 72 hours following injection. Furthermore, occasionally reactors fail to evidence a reaction within 48 hours following injection.

It appears that public stock yards at the present time are the most prolific source of reactors which find their way into otherwise clean herds and areas. It is believed that the utmost care should be exercised at those points in conducting the tuberculin test. Furthermore, if tuberculin tests completed in 48 hours were allowed at public stock yards, it would be impractical to insist on a 72 hour minimum when tuberculin tests are conducted at other points. Therefore, your Committee recommends that no change be made in the present regulations governing the application of the intradermal tuberculin test insofar as the period between injection and observation is concerned.
INOCULATIONS OF SPLENECTOMIZED CALVES TO TEST THE
EFFICACY OF THE COMPLEMENT-FIXATION TEST FOR
ANAPLASMOSIS


The usual method of testing "suspect" animals for anaplasmosis is the injection of blood from the animal in question into a splenectomized calf. This has been the accepted method for many years in spite of the fact that it is both expensive and time consuming. For a number of years the Bureau has been developing a serological test capable of detecting the carrier state of anaplasmosis. In April, 1949 Mohler and Eichhorn published a report on this test in Veterinary Medicine entitled "Complement-Fixation Test for Serum Diagnosis of Bovine Anaplasmosis," and in July of the same year Mott and Gates published in the same journal a report entitled "The Production of Antigen for Anaplasmosis Complement-Fixation Tests."

The application of the test to experimental herds of known status gave encouraging results. Consequently, it was decided to apply the test to serum from animals in the field. Through the cooperation of Maryland State officials, two of whom are the authors, the opportunity to make a survey of the 22 counties in the State was provided. A total of 557 herds of cattle were tested by complement fixation during this survey.

Of the above-mentioned Maryland herds, 10 located on the Eastern Shore, were selected as particularly suitable for use in determining the efficacy of the complement-fixation test for the detection of carriers. Five of these herds had a history of infection with anaplasmosis. Microscopic examination of blood from "suspect" animals in most of these herds gave positive results for anaplasmosis. Other cases of suspected anaplasmosis were diagnosed on the basis of the clinical symptoms.

MATERIAL AND EQUIPMENT

The 10 herds, consisting of 197 cattle, were tested by complement fixation. Of these animals, 57 were positive, 20 suspicious, and 119 negative. The serum of one animal gave an anti-complementary reaction. Two of these herds gave negative reactions to the test, and the remaining 8 herds contained animals that gave positive, suspicious, and negative reactions.

All the calves used in the inoculation experiments were splenectomized when about 9 months of age and averaged about 16 months at the time of inoculation. Each calf was confined to an open stall in small screened buildings, each of which held 4 animals. In view of the past results with anaplasmosis, this procedure is considered safe from the standpoint of possible transmission of the disease from infected to normal animals. For a week before inoculation, temperatures of the calves were taken twice daily and microscopic examination of stained blood smears prepared.

* Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, Washington 25, D. C.
† Maryland Livestock Sanitary Association
Table 1.—Efficacy of complement-fixation test in determining the presence or absence of anaplasmosis in cattle.

<table>
<thead>
<tr>
<th>Herd No.</th>
<th>No. Animals</th>
<th>History of Anaplasmosis</th>
<th>Additions to Herd in Last 5 Years</th>
<th>No. Animals Reacting to Complement-Fixation Test</th>
<th>Results of Inoculating Spleenectomized Calves with Blood from Complement-Fixation Tested Animals Reacting</th>
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<tbody>
<tr>
<td>1</td>
<td>13</td>
<td>No</td>
<td>Yes</td>
<td>POS: 1, SUB: 1, NEG: 11 aa in 38 days (1)</td>
<td>POS: aa in 26 days (1) SUB: Slight temperature rise about 4 days (11)</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Yes</td>
<td>Yes</td>
<td>POS: 6, SUB: 0, NEG: 1 aa in 33 days; died 7 days later (1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>Yes</td>
<td>Yes</td>
<td>POS: 8, SUB: 1, NEG: 4 aa in 28 days (1)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>No</td>
<td>No</td>
<td>POS: 0, SUB: 0, NEG: 19 —</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>37</td>
<td>Yes</td>
<td>Yes</td>
<td>POS: 13, SUB: 1, NEG: 23 aa in 35 days (1)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>No</td>
<td>No</td>
<td>POS: 0, SUB: 3, NEG: 27 slight temp. rise (3)² considerable</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>28</td>
<td>Yes</td>
<td>Yes</td>
<td>POS: 6, SUB: 5, NEG: 16 aa in 26 days (1)</td>
<td>Slight temperature rise 1 day (8)</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>No</td>
<td>Yes</td>
<td>POS: 9, SUB: 5, NEG: 6 Remained normal (1)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>Yes</td>
<td>Yes</td>
<td>POS: 11, SUB: 0, NEG: 1 aa in 22 days; died 7 days later (1)</td>
<td>Slight temperature rise (4)</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>No</td>
<td>Yes</td>
<td>POS: 3, SUB: 4, NEG: 11 aa in 27 days (1) slight temp. rise (1)</td>
<td>Slight temperature rise (10)</td>
</tr>
</tbody>
</table>

¹ aa indicates acute anaplasmosis; numbers in parentheses indicate number of animals from which blood was taken for inoculations.

² When the number in parentheses is higher than 1, pooled samples of blood were taken from the number of animals indicated.

³ One animal in this group gave an anti-complementary reaction.
from oxalated samples were made at frequent intervals. In no instance was *Anaplasma marginale* detected in the blood smears.

In preparing the slides, a standard stock solution of Giemsa's stain made according to recommendations for blood work was used at all times. A fresh solution was prepared each day by the addition of one drop of the stock solution to each cubic centimeter of sterile distilled water buffered to a pH of 6.5.

Before the experimental work with the splenectomized animals was begun, two separate complement-fixation tests were completed with the blood taken from each animal in the 10 herds. In these tests, two samples of 10 cc. each were collected from each animal. One sample was allowed to coagulate in order to obtain serum for the complement-fixation test, and to the other was added 0.2 cc. of an aqueous solution containing ammonium oxalate 6%, potassium oxalate 4%, to prevent coagulation and distortion of the red cells. In our microscopic examination of the oxalated blood samples from the herds under test no acute cases of anaplasmosis were detected. The blood serum samples from the herds were subjected to the complement-fixation test, with the results given above.

**INOCULATIONS**

After compiling the results of the tests made by complement fixation, it was decided that 10 cc. of blood from each animal should be used for the inoculum. In the case of the animals reacting negatively, and of those reacting suspiciously, a pooled sample was used as the inoculum, and when more than 1 animal in a herd reacted positively to the complement-fixation test (except herd 10) a single animal was selected at random for the inoculation test. It was believed that by this method failure of the complement-fixation test to detect any reactors could be readily determined. Furthermore, this method resulted in a saving of animals and thereby permitted the testing of a larger number of herds than would have been possible otherwise. The subcutaneous method of inoculation was used at all times.

**EXPERIMENTAL RESULTS**

The results of the experiment with the 10 herds are given in table 1. As will be seen in the table, in a number of the herds blood samples were taken from only a part of the animals reacting negatively to the complement-fixation test, for injection into the splenectomized calves. The reason for this was that only those animals were included which had been subjected to two consecutive complement-fixation tests.

The results show that of the 9 splenectomized calves that were inoculated with blood from random-selected animals reacting positively to the complement-fixation test, 7 developed acute cases of anaplasmosis; 2 of these calves died. Of 2 calves inoculated with blood from animals giving suspicious reactions, 1 developed an acute case of anaplasmosis. The other calf, which was inoculated with pooled blood from 3 suspicious reactors, did not develop the disease. All 10 calves that were inoculated with the pooled blood from the negative reactors to the complement-fixation test also failed to develop anaplasmosis. The results of this experiment clearly indicate, therefore, that the complement-fixation test is capable of detecting animals in the carrier state of anaplasmosis but may occasionally give a false reaction on normal animals.
Anaplasmosis continues to be responsible for annual losses estimated at from $4,000,000 to $6,000,000. In spite of years of research many questions concerning the disease remain unanswered.

Research is being continued and during the past year a project for additional work on a regional basis has been prepared and submitted for consideration under the Research and Marketing Act. To date no appropriation has been made.

Efforts during the past few years have been directed largely toward finding a therapeutic agent or agents that will: 1. Prevent death of affected cattle; 2. Destroy the causative agent. Work is being continued on a test to detect carrier cattle.

Because of the present high value of individual animals, owners and practicing veterinarians are especially concerned with saving the life of the cattle that contract anaplasmosis. This has resulted in the use of a number of preparations, some new, some old, and also various combinations of these preparations.

The drugs and chemicals tested include paludrine and quinoline diphosphate (synthetic antimalarial drugs), aricyl alone and aricyl combined with quinoline diphosphate, acaprin, and ethyl alcohol. The latter was given in combination with one or more of the following: Sterile distilled water, ferric chloride, atabrine, chlorophyll, mercurochrome, para-aminobenzoic acid, sodium chloride, ferrous sulfate and copper sulfate.

Field cases and experimentally induced cases of anaplasmosis were used in the studies. The experimental cases included cattle that had been splenectomized as well as some that had not been splenectomized.

Veterinarians who have published reports on experiences with this wide variety of therapeutic agents include Splitter (1) of the Kansas Station, Farley (2, 5) and Foote (4) and their coworkers at the Oklahoma Veterinary Research Institute and Pulling (3), a California practitioner. These men have reported recoveries of some of the treated cases, but none of them made any claims that the carrier stage was destroyed. Several of them state specifically that the recovered cattle remained carriers after recovery.

Entomologists are still searching for insecticides that will repel large biting flies which are frequently responsible for spreading anaplasmosis. Laake (6) states that thorough spraying with 0.1 per cent. pyrethrins repel flies for about one day. While spraying with 2 per cent. of DDT or methoxychlor has not protected animals from being bitten, the feeding flies have died subsequently. This toxic effect has been observed for about five days after treatment.

The Meat Inspection Division of the Bureau of Animal Industry has reported 429 cattle condemned for anaplasmosis in 1948 and 48 for the first six months of
1949. The greatest number of condemnations occurred during the months of September and October.

Although there still is no satisfactory therapeutic agent for the treatment of anaplasmosis, your committee feels that some progress has been made. Additional reports on results of the complement-fixation test have been made. Your Committee also feels that the membership of this Organization can contribute to the control of anaplasmosis by insisting that every possible precaution be taken in all surgical procedures, to prevent blood from being transferred from one bovine to another.

REFERENCES

DR. GARRETT: Mr. President, Members of the United States Livestock Sanitary Association: I have been often asked why the states don't have universal legislation on livestock sanitation. The more I learn about the various conditions in different states, the more I am convinced that we cannot have uniform regulations that would be applicable to all states, due to the fact that we have so many varied conditions.

For instance, in Iowa, we are an importing state. We import between a million and a quarter to a million and one-half cattle for feeding purposes. Our good state on the west, Nebraska, exports from a million and one-half to two million. We export between ten and twelve thousand. That is the movement of more cattle than many states have, some of them, at least, so your Committee on Rules and Regulations this year has attempted to approach this subject in a little different manner.

We have not in any way, nor do we intend to, write uniform regulations. We do not intend that any state shall change its present regulations. We have merely made a summary or a maximum of standard requirements of the states. In other words, we have taken the top requirements of all states and prepared them so that if I am asked that question when I go back home, I will have an answer.

For instance, should a pure bred breeder—and that is what we are mostly interested in in interstate shipment—should a pure bred breeder ask me how he can prepare his herd or keep it so that he can ship cattle to any state in the Union at any time, since I have made this study with the Committee, I can answer him.

I can say, if you have an accredited herd for tuberculosis, an accredited herd for brucellosis, and you make a test on that herd and they are negative to each disease within 30 days prior to entry, and that is recorded on an official health certificate of the state of origin, signed by a veterinarian and approved by the State Veterinarian in the state of origin, your cattle will be approved to go into any state of entry. That is something I did not know before I made this study.

The thing your Committee has tried to do here is to set up those top requirements, just as a guide for the livestock industry so if they want an answer to some of those questions, their veterinarian or the state official can tell them. Then, if we want to use those as a guide and put it in our Sanitary book, our little circular No. 1, revised, issued by the United States Livestock Sanitary Association, this would be printed in the front of the book as the top requirements for all states, not meaning that any state has to use that, but that is the top.

Then, printed under each state would be deviations. For instance, in Iowa I would say on tuberculosis, instead of having to come from accredited herds, I would say that we would accept a test if made within 30 days of date of entry. I would say the same thing about brucellosis. It will be noted when I read this paper that
provision is made for animals vaccinated as calves, we are recognizing them for interstate shipment up to twelve months following vaccination.

We in Iowa would accept them up to eighteen months should this be adopted, but there are those variations and that is all. Each state would have exactly the same requirements that they have today. They would need to change it in no way whatever. We attempted to do nothing with exhibition of animals because that is up to the state in which the exhibition is to take place.

Bear in mind this is not going to affect any state's present regulations. It is merely a summary of the top requirements and just a guide for some breeder that may want to know how he can take care of his animals through the year so that when he gets ready to ship them, they will be ready.

**SUMMARY OF MAXIMUM STATE REQUIREMENTS AFFECTING NO STATE REGULATIONS ALL DEVIATIONS TO BE DOWNWARD**

**Section 1—General**

A. No animal, including poultry or birds of any species, that is affected with or that recently has been exposed to, any infectious, contagious, or communicable disease or originates from a quarantined area, shall be imported into the state until written permission for such importation is obtained from the Chief Livestock Sanitary Official of the state of destination.

B. A copy of the approved official health certificate shall be forwarded to the Livestock Sanitary Official of the state of destination before the arrival of the livestock.

C. All livestock imported into the state shall be accompanied by an official health certificate or permit which must be attached to the waybill or shall be in the possession of the driver of the vehicle or person in charge of livestock.

D. Requirements for the exhibition of livestock may be secured by contacting the Livestock Sanitary Official of the state in which the animals are to be exhibited.

E. All animals covered by these regulations originating from public stock yards or which may be assembled at public stock yards from many sources of unknown origin shall be required to meet regulations of state of destination before being released.

F. Livestock entering the state without a proper health certificate, or a permit shall be held in quarantine at owner's expense until released by the Livestock Sanitary Official.

G. WHO MAY INSPECT: Accredited, licensed graduate veterinarians who are approved by the Livestock Sanitary Official of the state of origin and Veterinarians in the employ of the United States Bureau of Animal Industry.

H. WHO MAY APPROVE: All health certificates shall be approved by the chief livestock sanitary official of the state of origin.

**Section II—Official Health Certificate**

A. An official health certificate is a legible record covering the requirements of the state of destination, accomplished on an official form from the state
of origin, and approved by the State Livestock Sanitary Official of the state of origin and issued by a licensed, graduate, accredited veterinarian who is approved by the proper Livestock Sanitary Official of the state of origin.

B. The health certificate shall contain the names of, and addresses, of the consignor and the consignee, with an accurate description or identification of the livestock, and shall also indicate the health status of the animals involved including results of required tests as well as dates and vaccination, if any. Health certificates shall be void after thirty (30) days.

C. All agglutination tests for brucellosis which are intended for interstate movement shall be made in the state or federal laboratory.

Section III—Special Permits

A. Requests for special permits must be directed to the Livestock Sanitary Official of the state to which shipment is to be made, giving such information as number and kind of animals, origin of shipment and the proposed destination.

Section IV—Owners and Operators of Media of Transportation

A. Owners and operators of common carriers, trucks and other conveyances are forbidden to move any livestock into or within the state or through the state except in compliance with the provisions set forth in these regulations.

B. All railway cars, trucks and other conveyances used for the transportation of livestock and poultry shall be maintained in a sanitary condition.

C. Owners and operators of railway cars, trucks and other conveyances that have been used for the movement of any livestock infected with or exposed to any infectious, contagious, or communicable disease shall be required to have such cars, trucks, and other conveyances thoroughly cleaned and disinfected under official supervision, before further use is permissible for the transportation of livestock.

LIVESTOCK

(General Rules under Sections I, II, III, and IV apply to all subsequent sections)

Section V—Cattle

Tuberculosis

a. Cattle for dairy and breeding purposes may enter the state if they originate in an accredited herd and have been tested within the last twelve months.

b. Or if they are identified as originating in qualified negative herds, in modified accredited free areas, and the last herd test of which was made within the last 12 months, and the individual has passed an additional test for tuberculosis within thirty (30) days prior to shipment.

Brucellosis

a. Herds officially certified brucellosis-free or qualified herds in modified certified brucellosis free areas, in which all animals, except steers, in the
herd over six months of age were negative to an official test for brucellosis within twelve months of entry, and the animals for entry were negative to an official blood test within thirty days of the date of entry.

b. Herds under federal-state supervision for the control of brucellosis, in which all animals in the herd over six months of age were negative to an official blood test within six months of entry, and the animals for entry were negative to an official blood test within thirty days of date of entry.

c. Cattle under eighteen (18) months of age vaccinated under federal-state supervision with Brucella abortus vaccine between six (6) and eight (8) months of age, which originate in herds in accordance with paragraphs (a) or (b) may be imported into any state if not negative or without an official blood test, but the importation shall be at the request of the purchaser and subject to the approval and special written permit issued by the Chief Livestock Sanitary Official.

d. Cattle vaccinated under federal-state supervision with Brucella abortus vaccine, or any other biologic approved by the Bureau of Animal Industry, between six and eight months of age, and have been properly identified and reported to the Livestock Sanitary Official, are eligible for interstate movement up to one year following date of vaccination, without an agglutination test, provided they are accompanied by an official health certificate which has been approved and a permit granted by the Livestock Sanitary Official of the state of origin.

e. Unvaccinated calves under six months of age will not be required to be blood tested prior to entry, provided they are identified as the progeny and come directly from negative or brucellosis-free herds.

Feeder Steers

a. Steers may enter the state for feeding and grazing purposes when accompanied by a special permit and an official health certificate, indicating they have passed a negative test to tuberculosis and are free from all contagious and infectious diseases, provided they are maintained separate and apart from all dairy and breeding cattle.

Scabies—No cattle affected with or exposed to scabies shall be shipped, trailed, driven or otherwise imported into another state for any purpose.

Immediate Slaughter. Cattle for immediate slaughter, consigned to a recognized slaughtering center or public stock yards where federal inspection is maintained, may enter the state without a health certificate or a negative test to tuberculosis and brucellosis and shall be considered as under quarantine until slaughtered.

Section VI—Dogs

All dogs imported into the state for any purpose shall be accompanied by a certificate of health stating that the dog or dogs did not originate within an area under quarantine for rabies, or has not been exposed to such diseases, and have been vaccinated for rabies within the last six (6) months.

Section VII—Goats

Goats for dairy and breeding purposes may enter the state provided they are accompanied by a certificate of health showing a negative test to tuberculosis
and come from a brucellosis-free herd and negative to the agglutination test within thirty (30) days of date of entry. The health certificate shall contain a full description of each animal giving age, color and markings. Immediate Slaughter: Apparently healthy goats may be imported into the State when consigned directly to a recognized public stock yard or a slaughtering establishment, or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture and the Livestock Sanitary Official.

Section VIII—Horses, Mules and Asses

These animals may be imported into the state when accompanied by an official health certificate.

Section IX—Poultry

Chickens, turkeys, or other poultry over 5 months of age intended for breeding purposes shall not be imported into this state unless they have passed a standard intradermic tuberculin test and a negative agglutination test for pullorum disease under the supervision of a state livestock authority within 30 days preceding date of importation, or have originated from flocks authoritatively participating in such pullorum control and eradication phase of the National Poultry Improvement Plan or National Turkey Improvement Plan as may be adopted in state of origin.

Section X—Sheep

A. All sheep entering the state for purposes other than immediate slaughter shall be accompanied by a certificate of health indicating they are free from scabies and exposure to all infectious and transmissible diseases and that they have been dipped twice in accordance with the regulations of the Bureau of Animal Industry, United States Department of Agriculture, within fifteen (15) days previous to entry into the state.

B. Permit—Feeder Lambs: Lambs may be imported into the state for feeding purposes, provided they are accompanied by a certificate of health, indicating that they have been dipped in accordance with the regulations of the Bureau of Animal Industry, and a special permit is secured before shipment from the Sanitary Official of the state of destination.

C. Immediate Slaughter: Apparently healthy sheep may be imported into the state when consigned directly to a recognized public stock yard or a slaughtering establishment, or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture and the Livestock Sanitary Official.

Section XI—Swine

A. All swine imported into the state except those for immediate slaughter, shall be accompanied by a health certificate, stating that each animal has been vaccinated with anti-hog cholera serum and virus not less than thirty (30) days immediately prior to date of entry and originates in a Brucellosis-free
herd and are negative to the agglutination test within thirty (30) days of date of entry. All dates to be marked plainly on the health certificate. A copy of the certificate of health shall accompany the swine while enroute.

B. *Feeding Purposes:* Swine for feeding purposes may enter the State providing they are accompanied by a health certificate indicating they have been vaccinated with anti-hog cholera serum and virus, thirty (30) days prior to date of entry, and are free from infectious or contagious disease.

C. *Immediate Slaughter:* Swine may be imported for immediate slaughter without a health certificate, provided they are consigned directly to a recognized public stock yard or to a slaughtering establishment or slaughtering center that is approved and designated by the Bureau of Animal Industry, United States Department of Agriculture, or the proper Livestock Sanitary Official.

**EXAMPLE**

**IOWA**

**Deviations**

(This is a sample of the deviations which will appear in Circular I under Iowa)

**Section V—Cattle**

*Tuberculosis:* Thirty day test acceptable.

*Brucellosis:* Thirty day test acceptable. Vaccinates acceptable up to eighteen months after date of vaccination.

*Feeders:* Non-pregnant females may move into the state, under quarantine for feeding purposes, providing a permit is first secured and they are accompanied by a health certificate.

**Section X—Sheep**

B. *Permit Feeder Lambs:* Permit only required, subject to quarantine at destination.
DISCUSSION OF REPORT OF THE REPORT OF THE COMMITTEE ON LAWS AND REGULATIONS

Mr. Montague: Mr. Chairman, I wonder if the committees who have given their reports, under the by-laws of the Association, are those reports made to the Association or the Executive Committee alone?

President Brandenburg: They are made to the Association and referred to the Executive Committee.

Mr. Montague: When are they referred?

President Brandenburg: Right after they are delivered.

Mr. Montague: By whom are they referred?

President Brandenburg: By the Committee.

Mr. Montague: By the Committee?

President Brandenburg: Will you explain that to him, Dr. Hendershott?

Dr. Hendershott: As these committee reports are given, the person delivering the report makes a recommendation that the committee report be referred to the Executive Committee.

Mr. Montague: But no action was taken on it.

Dr. Hendershott: Action should be taken by this body, a vote to refer or not to refer.

Mr. Montague: There has been no vote on these committee reports.

Dr. Hendershott: Is there any particular report you have in mind?

Mr. Montague: Yes, Dr. Garrett's report of the Committee on Laws and Regulations.

President Brandenburg: Apparently the Judge has us on a technicality. It was referred but not voted on by the body. He has reference to Dr. Garrett's report on the summary of the top regulations of the various states as made to you a few moments ago.

What are the wishes of the Association?

Mr. Montague: I would like to discuss that before it is voted on. . . . It was moved and seconded that the report be referred to the Executive Committee . . . I feel a little funny about getting the floor the way I did, but because of the peculiar conduct of the affairs of the Association, I am not used to that method of parliamentary procedure and I didn't understand it, and, therefore, did not avail myself of the opportunity at the time the matter was read and no further action was taken on it.

We have some discussion to make with reference to the Committee's report on Laws and Regulations.

I am speaking strictly in behalf of the producers of livestock. We producers have been caused to stop and count the score with reference to this particular Association. We understood a number of years ago that this organization was made up of the people interested in livestock sanitation, that it was, therefore, one of the general topics, one in which producers had a place as well as the veterinarians and the livestock sanitary officers in the various states and nations.

We have been wondering whether or not our understanding of that has been
DISCUSSION OF REPORT

correct because there was read to you and to us a very lengthy, no doubt a very able,
presentation of the ideas of a committee relating to proposed laws and regulations.
The first time we ever heard that was when it was read today. Yesterday a couple
of us did get at the tail end of the meeting where some of that was discussed. I did
not hear it all discussed. I have not, to this good hour, seen a copy of it.

I asked the Chairman of the Committee to give me a copy before this meeting
opened up, immediately after lunch, some half an hour or an hour before this meet-
ing started, and he told me no copies were available. We had no idea of what was
in that report. No one here has any comprehension of what is in the report from what
is not in it. You couldn’t possibly understand it in detail and it is detail that makes
the laws and regulations.

We are asked here to refer a matter to the Executive Committee for adoption by
them that we don’t know about. We do know it has the approval of the respective
State Veterinarians and other veterinarians, but we know also that no single live-
stock producer knows anything about it. Therefore, we certainly are not in a posi-
tion to vote to refer it to the Executive Committee or to take any action on it. We
think it is but justice and just a common right that a report of that importance
should be laid out for some study before the entire committee—rather before the
total convention, so that individuals who are interested in it might form some
idea about it.

We have absolutely no idea whether we are in favor of it or opposed to it, whether
we have any suggestions to make, whether we have any amendment to it. We just
don’t know, and as a matter of common justice, we think that that should be laid
out for discussion on the floor and discussed in detail, and that copies of it should
be made available to the convention, not just to the Executive Committee, because
I know we as producers do not subscribe very strongly to the idea of having a com-
mittee run the affairs of the Association we belong to. We think that the mem-
bership, in a true demonstration of democracy, should know what the Association is
doing and we should have a voice in the doing of those things.

From what little I could understand of the report, I realized that it is supposed
to be a maximum requirement that the respective states could make. However,
there were a lot of new things in there so far as we are concerned, things that we do
not understand from the mere reading of the report, and for that reason, Mr. Chair-
man, I am going to move that that be tabled until it has a full and final discussion
and treatment on the floor of the convention.

PRESIDENT BRANDENBURG: Judge, there is also a motion before the house. Do
you want to make that as an amendment to the motion before the house?

MR. MONTAGUE: I make it not as an amendment, but as a substitute motion for
the one already pending.

DR. WEST: The motion to refer Dr. Garrett’s report to the Committee has been
seconded.

PRESIDENT BRANDENBURG: Yes, it has been seconded.

MR. MOLLIN: Does it mean when the Executive Committee accepts the report,
that you accepted the maximum regulations of any state as being the regulations
that should be accepted all over the United States?

PRESIDENT BRANDENBURG: Dr. Garrett, are you here?
Dr. Garrett: Yes, sir.

President Brandenburg: Will you explain that once more?

Dr. Garrett: I don't know whether there is any more to say on that. The committee simply made an outline of existing regulations. As I mentioned before, we have not recommended that any state adopt those regulations. There will be no change in any state regulations so far as we are concerned. We are just trying to provide an instrument whereby the livestock industry may have a guide to prepare their animals so that they can be shipped to any state in the Union.

I called to your attention that one state has less than a page of regulations for livestock to be imported in its state. Iowa has seven. Another state I know of has fifteen. If you have a copy of circular one, you can verify that, our recommendation does not change regulations.

Mr. Mollin: I understand that. What I want to know is whether the Executive Committee, if it votes to endorse that report, places this association on record as favoring these regulations and their extension throughout the United States, certainly some of them are unworkable and I don't think we want to go on record as favoring them.

You refer in one place to where hogs could be moved across a state line for immediate slaughter, if confined to a recognized public market, and I assume the same rule applies to fat cattle.

There are hundreds of markets throughout the country, auction markets, and concentration points where that stock moves across state lines to those points and is not slaughtered. You certainly don't want to make a regulation that is contrary to the usual custom of marketing livestock in the country.

In Colorado, mixed bunches of cattle are trucked across to other states. There are auctioneers all through that country and the stock comes in there in mixed lots, and many of those points have no slaughtering facilities, and I don't think this thing is practical.

If you are merely compiling the regulations of all the states, I think it is good for everybody to have, but if the Association is approving these regulations, as being the ideal regulation, it certainly should be discussed and considered because I don't think you want to do that.

Dr. Garrett: That is true to one extent. In Iowa we are glad to have cattle from Texas come in for feeding purposes. We like to have them come into our slaughter houses, but we don't like to have livestock moved into community sales from outside the state without a permit, without our knowledge, and we do not allow it, and if we catch them, or if the highway patrolman catches them, or one of our district agents, charges are brought against them.

Dr. West: This report you made is not what you recommend as regulations, but is a compilation of existing top requirements of all existing regulations.

Dr. Garrett: That is right. As I mentioned to you awhile ago, some states require that breeding cattle or dairy cattle imported into their state, must come from a herd accredited for tuberculosis and negative to that test within 30 days.

In Iowa, we do not require that they come from accredited herds, but some states do—if livestock men wish to prepare their animals for any state in the Union, the above tuberculosis requirement, if met, will provide admittance to any state.
Mr. Mollin: I don't object to your having this compilation but I think it would be wrong for this Association to endorse the top regulations that anyone of the 48 states might have seen fit to pass. Some local condition might have brought that about. It seems inconceivable to me that this Association, representing all the breeders as well as others, should say, "This is it, boys. This is the way it ought to be. We are endorsing it."

We can't go along with that. We don't even want to belong to an Association that functions in that fashion.

President Brandenburg: Mr. Mollin, I did mention before a subject that I hoped to clarify this thing. It is my understanding that all this Association is endorsing is that we will let Dr. Hendershott put that information in the book he is going to print. That book has become so big, and it is so difficult to find the various regulations, I think that Dr. Garrett's idea and the idea of the Committee was just to simplify what we have already got.

Mr. Mollin: I have no objection to that. If the Association recommends that this be put out as what it is, a compilation of the top requirements made in any place in the country, that is all right, but not with the endorsement of this Association that they are ideal throughout the country.

Dr. Garrett: You are right on that and we have not in any way done that. The idea I had was that we attempted for forty years to get uniform regulations. It has been worked on, and the last year, I believe the Committee reported that the various states reported on it, but it hasn't lead to anything.

What I would like to do is have a compilation of the top health requirement printed in circular one to which I can refer my livestock men to prepare their animals to go any place. I do not expect this Association or the Executive Committee to endorse and recommend it as a standard of requirements. That is not the purpose or intent.

Mr. Montague: Dr. Garrett, do you have any objection, I am sure you haven't, any objections that we will leave this report over to the Committee?

Dr. Garrett: You were a little over enthusiastic, Mr. Montague, about talking to me an hour before I prepared that report. I had so much trouble about getting the report printed, we set up three copies, one copy is over there and one is over at Dr. Geyer's office and the other is over in my room, and it was finished just a few minutes before I arrived here this afternoon.

I was up here at 25 minutes after 1:00 and was first on the program and I went back to get the Committee's signature and you asked me then to have it.

Mr. Cavanaugh, who is on our Committee, kindly consented to have several copies of that run off so that they will be available in the morning.

I told you then, Judge, that I didn't have an extra copy, but I promise you I will have an extra copy tomorrow.

Mr. Montague: Mr. Chairman, that demonstrates very clearly exactly the point I was making, the danger that always lies in signing a paper without reading it, or in voting on any matter in a convention without knowing what you are voting on.

Dr. Garrett said that the thing was changed around yesterday. I don't know how it was changed. I would like to see it in writing.
I renew my motion that the matter be tabled for further consideration.

Dr. West: Mr. Chairman, do you have a copy of the constitution and by-laws available?

Dr. Brandenburg: The Secretary has a copy here.

Dr. West: Do not the by-laws provide for the method of disposing of committee reports?

Dr. Hendershott: Yes.

Dr. West: Will you please read it?

Dr. Hendershott: This is what the constitution and by-laws have to say relative to the duties of the Executive Committee.

The Executive Committee shall constitute the administrative body of this organization and shall regulate the policies. All recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee.

Dr. West: Mr. Chairman, it would seem, therefore, that a motion to refer a report to a committee would be superfluous. It has been the practice for many years to do so, however, I can see no reason why such a motion is even necessary. Under the constitution and by-laws, the committee report will be referred to the Executive Committee at the proper meeting.

Mr. Montague: I make a point there. Who refers it?

Dr. West: The Secretary refers it to them after it is given to him.

Mr. Montague: I refer my question to the chair.

Dr. Hendershott: It says the Executive Committee shall be composed of the executive officer representing livestock officers of the various states' territory, and various other executive regulatory officers and the elective officers of this Association.

Then it further states the Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies, all recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee.

It doesn't say who is going to refer it or how it gets referred.

Mr. Montague: Then let's get down to the members, then. To whom is a committee responsible? Is it a committee of this Association or is it a committee of the Executive Committee?

Dr. Hendershott: We have always interpreted that the committees are of the Association.

Mr. Montague: I think you are correct. If that is correct, then the function of the committee is to report to the Association and the Association, then, if they wanted to, would refer it to the Executive Committee or refuse to refer it. The discretion lies with the membership of the Association.

Dr. Hendershott: I don't see it written here but I do believe that has been our procedure in the past and I don't know why we should deviate from it at this time.

At other times, we discussed committee reports on the open floor of the convention and I believe that is where they should be discussed. I am with you a hundred percent and I believe that is the proper way to handle it.
I suggest that the Executive Committee will meet this evening, and again tommorow evening, and again for its final meeting on Friday. If this meets with the approval of the group, I think it would be inherently fair that we provide for the great Lone Star State, the Republic of Texas, which we are proud to have included in the United States at the present time, goodness knows how long, but we have them now, and let the Republic of Texas take this and go over the report and make their comment on it, I would suggest on the floor of the convention before the Executive Committee takes final action on the report of this Committee.

Mr. Montague: In the meantime, will copies of the report be available to study?

Dr. Hendershott: I don't have the means of making it available to you, but Dr. Garrett says Jim Cavanaugh has consented to provide extra copies.

Are there other people in the room who likewise would like to peruse this report in order that they, too, may comment on it when it is next brought up for discussion, if that meets with your approval?

Dr. Quinn: Mr. Secretary, it was spoken of a few minutes ago about the power of legislation. The Judge is a member of the Legislative Committee.

Judge, have you a copy of your Committee on Legislation's report that you can hand to all members present?

Mr. Montague: There has been no meeting called by the Chairman. I don't know how it is to be called.

I would say that that question was not honestly asked. I have given him a reply that is absolutely honest. There has been no meeting of the Legislative Committee, none at all, and I don't know whether any will be. The Chairman isn't here.

Mr. Garrett: Mr. Chairman, if we don't spend too much time on the floor, we will have copies back tomorrow morning.

Mr. Mollin: It makes no difference how much we study this report, it would make no difference in the point I raised. I am very sure if you took the leading men from your various states and put them to work to try to work out uniform laws and regulations that would be applicable to the United States, that you would not come out with what this report contains which is the maximum that any state has seen fit to impose and I can't conceive of this Association needing or wanting to adopt this report.

Furthermore, I might suggest that it seems to me that the by-laws might be revised a bit so that the convention will be the governing body instead of the Executive Committee.

Any Association with which I am familiar, and certainly in my own Association, when the convention is in session, it is the final power of our Association. When it isn't in convention, the Executive Committee is in power, but these reports should be prepared for discussion by the convention.

We are interested in these laws. These reports come in and are immediately referred to the Executive Committee. It makes no difference to me, if this Association endorses this report as it stands, I think the livestock industry is forced out of your Association.

Dr. Hendershott: I don't want to say that I would subscribe to that because I don't feel that way about it, however, I do think in a democratic form of govern-
ment that the voice of the convention should certainly be heard with respect to these matters that are of tremendous importance to them, and in all fairness, I am sure my co-workers will feel as I do.

We don't come here to meet to try to develop some cockeyed regulation and then go to the industry and try to shove it down their throats. We are honestly trying to do a job for the betterment of the livestock industry.

For years, we have been condemned for not having a uniform regulation and people don't quite seem to understand why in this country of ours it is practically impossible to have a uniform regulation that will fit all conditions. We will not accept it in New Jersey and I don't think any other state in the Union will accept this in its entirety and make it work. That was not the intent.

This was the major requirement of the compilation of regulations of all the states. If anybody complied with that, their livestock could go anywhere in the world.

Mr. Willoughby: I happen to be from the Republic of Texas. I am not a veterinarian. I am a member of a sanitary board and a rancher. I want to say that I admire any state that wants a high standard of regulations, but this is a thought that occurs to us.

He said he would like to have our cattle in Iowa. We would like to get them back.

If you have a set of uniform regulations as has been proposed here today, that some states can't live with, and it is sanctioned by this group, how does the producer know that they might be lowered or they might be deviated from, or it might be made impossible for him to get his cattle in? How will he know it?

President Brandenburg: Mr. Willoughby, the deviations for the various states are to be printed in Circular 1, revised and as I explained it before, I think it is our purpose to simplify that book so that you could more readily find what you want to find. I know of no other reason. It is all in the book now, but it is so big, some 257 pages in it now, and I know I have to refer to it daily, and I just have a lot of trouble finding those states and what they want. It was merely to simplify what is already in that book, and I can't see for the life of me what all the argument is about.

Dr. Garrett: This is not a uniform regulation. I made that statement just as plainly as I could. The regulations would be no different from what they are now and I am sure no state is going to raise its requirements.

Mr. Willoughby: That is all right, and when we see it in writing, we will go for it.

Dr. West: I haven't yet got quite clear my recollection that in the procedure for handling reports of committees is that they be referred to the Executive Committee and that the Executive Committee reports back their recommendations to the whole body for the adoption and that is the time when there is ample opportunity for the general body to accept or not accept the recommendation of the Executive Committee. Is that correct?

Dr. Henderson: We have sometimes done that, but there is no provision for that in the constitution and by-laws that I can find.

Dr. West: That is the reason I asked for that ruling. I move that the question of laying this on the table be voted on.

I am asking for the question.
PRESIDENT BRANDENBURG: There is a motion before the house.

It has been moved and seconded that the report of the Committee on Laws and Regulations be referred to the Executive Committee. All those in favor of that—

DR. WEST: There has been a substitute motion.

A MEMBER: The constitution and by-laws says these reports shall be referred to the Executive Committee, and so long as we go by our constitution and by-laws, there is no vote called for on the floor of this convention at this time.

MR. MONTAGUE: If, as Dr. Hendershott says, it means that the Association makes references to those things, then a vote is called for and I offered an amendment to the motion to refer it to the Executive Committee namely that it be tabled and I ask that be voted on. It is a motion to table.

PRESIDENT BRANDENBURG: All right, let's vote on Judge Montague's substitute motion.

You have heard the motion, do I hear a second?

... The motion was seconded ...

PRESIDENT BRANDENBURG: The motion was seconded by Duval Davidson.

MR. ARNOLD: Mr. Chairman, I am just one of these cowpunchers, not a veterinarian, but a member of this Association. We recognize the veterinary profession has something necessary in our industry. We need the veterinarians. We want to work with you. We believe you want to work with us.

Now, so far as this proposed maximum regulation is concerned, and Judge Montague's statement, we haven't had an opportunity to know just what it means, just what all there is in it. I know our various organizations of stockmen have asked for something of this kind. We are vitally interested in it.

Now, as the gentleman who has written this regulation, the Chairman of the Committee, it has been written and torn up several times. Evidently there has been some dissatisfaction in their own group as to what this regulation is. We can work this thing out. Let's don't be too hasty about it. Let's just take a little time.

We want to work with you men. We don't want to have to go back to our Organization and take exceptions to the things that you have done here. When we do that, that means there are thousands of people taking exception to the thing that you have done here, and, consequently, we have gotten nowhere.

Let's try to work together. I think you are too hasty in this thing. We have got our men here. We have got our State Veterinarians here who haven't had a thing to say about this thing, and now it is being referred to the Executive Committee which is just a little body of this Organization.

I think that the thing we had better do on this subject is send this back and wait until next year to adopt this thing. We have lived with the present regulations for a good many years. We can certainly get along with them for another year.

In the meantime, let's refer it to our people and see what they think about it. Let's just try to work together. I don't think you people want to push something down the throats of the livestock people, but nevertheless we have to live and operate under these regulations. We would like to have something to say about it,
and we don’t want to have to go back to our Organization and take exception to the thing that the U. S. Sanitary Association has done. Let’s just table this thing for the time being.

PRESIDENT BRANDENBURG: There is a motion before the house to table the report of the Committee on Laws and Regulations.

DR. H. E. CURRY OF MISSOURI: Mr. Chairman, I would like to talk on the question.

Gentlemen, it has been written, “As you sow, so shall you reap.”

We were privileged this morning to listen to the Honorable Governor of the State of Ohio who told us of some of the things he read in the morning newspaper. He told us how 40,000 citizens of the country of Czechoslovakia were imprisoned, moved probably into exterior darkness. Why? Because they believed in democracies.

It has been my privilege to visit in Czechoslovakia. I never saw a group of people who took their democracies more seriously than they did. My heart goes out to see people who feel that way to be crushed.

A few years ago, to be specific, two years ago, this Association voted to move our meeting to various sections of the states to points from whom invitations might be received. The thought behind that was to bring this Association to the industry that we, as livestock sanitary officials, are pledged to serve.

We met in Denver, today we assemble in the fair City of Columbus, and here we are locked in a debate for what? For a committee report of no important significance. We were told yesterday, and we were told today that all it is is a compilation of the maximum requirements of the states.

As Dr. Garrett, the Chairman, stated, a fellow that wants to have a uniform regulation or that complains about the lack of any uniformity in the various several states’ regulations, that here is something that he can do: Prepare his animals, his flocks, and his droves, and get them in order and then they can be moved into any state in the country.

That is fine. I find no objection to that form of procedure, but, gentlemen, bear this in mind. If that is all there is to it, then why should we have to consume so much valuable time here in debating it? Why not table the report as has been the procedure on some other committee reports?

Last year your Committee on Tuberculosis drew up an amendment to its report, and that report was not adopted at Denver. It was moved that it be referred to the livestock officials of the several states for perusal and for suggestions, and then referred back to the assembly here for action. That is all that is being asked, as I understand it, by the gentlemen who are here representing the producers of livestock.

Are we going to say to them, “No, we are going to rule by decree?”

Again I call your attention to the remarks of the Governor of Ohio when he cautioned us and warned us that everybody be vigilant, that everybody be alert, and pray that we will continue to live under a democracy and will not be governed by decree.

Gentlemen, I second the motion that is made by the previous speaker that the report of the Committee on Uniform Regulations be tabled and that those who
want copies be provided with a copy, and then the question be put and voted on at your next annual meeting. (Applause)

DR. GARRETT: Mr. Chairman, I am very sorry to get up again. I feel that I owe an apology to the assembly. There have been several questions raised here that perhaps I am not aware of as Chairman of this Committee, but I know the Committee has tried honestly to get uniform regulations.

We have found out that that cannot be done. The thing that I had in mind personally, and I am sure my Committee will agree with me, was a service to the industry, to the livestock industry. In Iowa the livestock industry is the big thing. That is what we depend on. I am very sorry that this thing has caused so much discussion. It is not my intention to interfere with the shipment of any animal to any state with the exception of Iowa. If they comply with our regulations, I am glad to have them.

I want our livestock producers in Iowa to get all of the livestock from Texas, Nebraska, Wyoming, or any other state. That is their business and I want them to go ahead.

The only thing that I am expecting in presenting this report was simply that it would be a gauge for those engaged in the raising of pure bred livestock that they could so prepare their herds. I do not want to see any stiffer requirements. I would like to see more disease control in each state so that in the end we would lower our requirements and not raise them.

The thought I had when I made this report and offered it to the Committee was that they would simply print it in the revision of Circular 1 that will be out later, perhaps, in the year, or next spring, and then it would be just a standard, just a gauge that the livestock men could see what the maximum requirements are. That is all.

MR. MOLLIN: You would have no objection to referring that to the various states?

DR. GARRETT: No, absolutely not.

MR. ARNOLD: We could lay that over and have an opportunity to study it. You say yourself that it was torn up two or three different times, there was some misunderstanding in your own group, dissatisfaction, I should say, in your own group. I think that the very best thing to do would be to lay it over. It is important enough to the industry that we should take some time to study it and that is all we are asking this body to do.

If you don’t do that and we don’t like it, then we are going to have to take exceptions to the action taken by this Organization by our various states and national organization which we shouldn’t do. We should work together in place of fighting. Let’s do that.

DR. GARRETT: Stencils are now being cut and copies will be available later in this meeting.

MR. MONTAGUE: How will we know what we are voting on until we see the copies?

PRESIDENT BRANDENBURG: Gentlemen, we have quite a program. We have the motion and second to table this report. I think we should vote on it.

... The question was called for severally ...
President Brandenburg: Those in favor please indicate your wishes by raising your right hand. This is on the motion to table.

All those in favor of referring it—those opposed?

I declare that the report is tabled.

This report was tabled by the general assembly with the idea that it would be printed along with the discussion in order to provide everyone an opportunity to study the report and be prepared to reconsider it at the 1950 meeting in Phoenix, Arizona, November 1–2–3, 1950.
INTESTINAL PROTOZOA OF TURKEYS

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The purpose of this paper is to give the present status of some of the more important protozoan infections in the intestinal tract of the turkey. Some of the work reported is in the nature of a review, while most of it is presented here for the first time.

TRICHOMONIASIS

The only avian trichomonad for which there is incontrovertible evidence of pathogenicity is Trichomonas gallinae occurring in the mouth, pharynx, esophagus and crop of the pigeon and rarely the turkey. This is a very serious infection when it does occur in the turkey, but due to its rarity will not be further discussed here. The pathogenicity of the trichomonads of the posterior digestive tract is still in a very controversial state, but at the present time there is no clearcut evidence which would associate them with any disease entity. Delaplane (1931) and Hawkins and Dunlap (unpublished data) have been unable to produce any disease or pathological lesions in turkeys infected with Pentatrichomonas gallinarum, although the birds are easily infected. The work of Allen (1936, 1940) relating this organism to infectious enterohepatitis requires further investigation before it can be accepted.

HEXAMITIASIS

The status of this infection in turkeys is still unchanged. From reports received up to the present time it is apparent that it is present over most of the United States, although most of the serious outbreaks have been reported in turkey poults in California by Hinshaw and his co-workers.

HISTOMONIASIS

Infectious enterohepatitis or "blackhead" in turkeys is still a serious problem to many producers. Despite the fact that it is theoretically and practically possible to prevent infection with this parasite, conditions frequently arise on the farm which could not be foreseen and thus introduce the disease, usually with serious consequences. Unfortunately investigations on the etiology, biology, control and treatment of this parasitic disease have been rather scant in recent years. However at the present time there has been a decided return of interest in this infection, both from a biological and therapeutic point of view.

The most important recent contribution to our knowledge of this disease is by Connell (1950) and is concerned with his finding of small, oval bodies about 3 microns in length in the larvae of the cecal worm Heterakis gallinae. He believes that these may be the form assumed by Histomonas meleagridis in the cecal worm egg and larvae, and that they are the infective form of this organism for the turkey. If this proves to be the case this will be the first time that this protozoan parasite has been observed in its infective stage and is the first concrete evidence that the
histomonad is transmitted by the cecal worm, although there has existed for many years strong circumstantial evidence.

At the present time we know little about the biological requirements of this organism. However, it is of interest to note that Delappe (1949) has found that the addition of penicillin and streptomycin to culture media facilitates the isolation and cultivation of this organism \textit{in vitro}.

The greatest activity in the past few years has been directed towards finding an agent which is either prophylactic or therapeutic in nature, or both. The use of arsenicals such as "Mapharsen" has been attended with some success, but no method of utilizing these drugs in the feed has been developed, and it is still doubtful if they will be effective after infection has taken place. Swales and Frank (1948) in trials with several compounds against infection have found that the following have no value: sulfamerazine, sodium sulphamethazine, emetine hydrochloride, "ata-brine" dihydrochloride, a quaternary ammonium compound ("formula 144") (dis-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl-ammonium chloride) and "stibiphen" a stable antimony compound of sodium pyrocatecholdistulphonate. Delappe (1949) observed that aureomycin when administered daily at the rate of 5 mg/kilogram of body weight, was ineffective against this parasite when given as a course of treatment either before and during the infection or after infection had taken place.

DeVolt and Holst (1948) have observed favorable results with "vioform" (iodochloroxyquinoline) in a preliminary report on the preventive action of this compound against infectious enteric hepatitis. They also observed that sulfathiazole and sulfaguanidine were of no value against this infection.

\textbf{C OCCIDIOSIS}

Coccidiosis in turkeys has usually been dismissed as a relatively unimportant infection; however, it is becoming apparent that in poult it may be an extremely serious infection. Up to the present time there have been described two species of coccidia from the turkey, \textit{Eimeria meleagritmis} from the small intestine, and \textit{Eimeria meleagridis} from the cecum. In addition we have isolated oocysts* from material sent to us from scattered sections of the United States which appear to be similar to, if not identical with \textit{Eimeria dispersa} described by Tyzzer (1929) from the bob-white quail (\textit{Colinus virginianus virginianus}). Whether or not this will prove to be the correct name for this species, we do know that there are at least three distinct species of coccidia in the turkey, two in the small intestine, and one in the cecum.

\textit{Eimeria meleagritmis} is the most pathogenic of these three species, and, in our limited experience with experimental infections, it frequently produces a high mortality in poult two to three weeks of age. Slightly older birds are not as easily killed by this parasite, but severe weight losses result. The symptoms produced by this species are not characteristic. Within two or three days after infection, feed consumption begins to drop, and four days after infection the feathers are ruffled, the wings drooped, the eyes closed and the birds closely huddled. Frequently the poult hold their heads between their legs and cheep almost constantly, all the time keep-

\* This work was made possible through a grant by Swift and Company, Chicago, Illinois.
ing their eyes closed. We have not noted this posture or activity in any of the other forms of coccidiosis in the turkey. The droppings are scanty and slightly fluid. At the peak of the disease, i.e. five to six days after infection, the feces frequently appear as cylindrical pellets, one half to three quarters of an inch in length, one eighth to one quarter of an inch in diameter, with the ends cut off as if with a knife. Bloody droppings are not observed in this infection in the turkey, although occasionally a few flecks of blood will be noted. Death usually occurs on the fifth and sixth days after infection. If death does not terminate the disease weight losses will cease about the seventh to eighth day after infection and a gradual recovery will result.

The pathological picture presented by this infection in the turkey makes a diagnosis from gross lesions rather difficult. The small intestine in which this parasite localizes is essentially normal until about four days after infection. At this time the small intestine is slightly thickened and dilated, and there is an increase in the amounts of fluids in the duodenum and first part of the jejunum. The contents are frequently mucoid in nature and greenish in color. Five to five and one half days after infection the lumen of the small intestine is empty, and the mucosa of the duodenum and jejunum is white. Occasionally small areas of congestion and petechial hemorrhages are noted. The only evidence of hemorrhage in this infection is a slightly pink coloration infrequently observed in the accumulated fluid, and the thin strands of clotted blood which appear in the lumen. Six to seven days after infection the intestinal contents in the posterior part of the jejunum and the ileum are usually in the form of a cylindrical, greenish, mucoid cast, measuring one eighth to one quarter of an inch in diameter. Therefore, the main lesions which are noted in this infection are the catarrhal enteritis, the accumulation of fluid and the greenish mucoid cast in the posterior half of the small intestine.

The protozoan is found throughout the small intestine and to a lesser extent in the rectum, but has not been observed to localize in the cecum. It is most numerous in the middle third of the small intestine, although large numbers may be observed in the duodenum and ileum. The parasites are usually located superficially to the nucleus of the epithelial cell, and are all found near the tips of the villi with none having been seen in the crypts. All the developmental stages are found in the epithelium, none occurring in the lamina propria. The life cycle of this species in the turkey is a typical coccidial type of development. The first asexual generation is completed in two and one half to three days after infection. The second asexual generation is completed about four days after infection. The third generation is predominantly sexual and oocysts are passed in the feces of infected birds towards the end of the fifth day after infection. A fourth generation, initiated by scattered third generations merozoites, occurs. However, we have not followed the course of this infection past the eighth day after infection.

Four to four and one-half days after infection there is microscopically a noticeable edema, the tips of the villi are necrotic, and the epithelium is much thinner and has disappeared in many areas. Five days after infection the villi are markedly edematous, and the epithelium from the tips of the villi, particularly in the middle third of the small intestine has been lost. The lamina propria is only separated from the intestinal lumen by the basement membrane, and it is amazing that this is not bro-
In the small intestine of turkeys, large dilated capillaries are noted in most of the villi in direct contact with the membrane and hemorrhage is not observed. In severe infections, few parasites are noted in the middle third of the small intestine at this time, because there is no epithelium left which they may parasitize. Except for a slight infiltration with lymphocytes and very few eosinophiles during the latter part of the infection, the lack of cellular reaction is noticeable.

We have carried out only limited experiments testing the efficacy of therapeutic agents against this infection. The following drugs in the feed are effective as prophylactics: sulfaguanidine (0.2%), sulfaguanoxaline (0.3%). Sulfamerazine (0.2%) was effective as a therapeutic agent 96 hours after infection had taken place, but none of the other compounds were tested in this manner. Peterson (1949) has determined the minimal prophylactic level of five sulfonamides against this infection, giving the drug in the water. The results were as follows: sulfaguanoxaline (0.005%), sulfapyrazine (0.005%), sulfachlorodiazine (0.01%), sulfamerazine (0.02%) and sulfamethazine (0.02%). The minimal level for sulfaguanidine in the mash was 0.1 per cent. He further showed that birds exposed to infection and medicated at the prophylactic level with the test drug showed complete survival when the treatment was begun as late as 96 hours after infection, and continued for four days or longer.

The second species which occurs in the small intestine of the turkey is considered at the present time to be identical with Eimeria dispersa which was originally described from the bobwhite quail by Tyzzer (1929). At that time he was able to establish infections with this parasite in the turkey and chicken, although a second transfer failed to produce infection. The oocysts of this species are distinguished from all others by the absence of the small globular inclusions in the sporulated oocyst. This species has been recovered by us from material sent in from turkeys from Connecticut, Iowa, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, North Dakota, New Jersey, Oregon and Utah.

This species is relatively non-pathogenic, and it has not been possible in our experience to produce death of experimentally infected poults, depression in weight gains or interference with feed consumption.

The pathological picture presented by this infection is typical and facilitates a diagnosis, in contrast with E. meleagritis infections. Lesions are not usually observed until about four days after infection, at which time the small intestine is dilated, and the anterior half appears white from the serosal surface. Four and one half days after infection the duodenum is devoid of feed and is filled with a whitish mucus; the middle third may be slightly congested and a very small amount of hemorrhage may be noted, while the mucosa of the ileum is white and slightly thickened. Five days after infection the entire small intestine is grossly dilated and the duodenum and the first part of the jejunum are creamy white in color as viewed from the serosal surface. On opening the small intestine is found to be filled with a sticky yellowish white mucoid material in which oocysts will be observed towards the end of the fifth day after infection. By eight days after infection the intestinal tract has about returned to normal. The main lesions which are noted in this infection are the marked dilation of the small intestine and the creamy yellowish mucoid material which fills the lumen of the first half of the tract.
The parasite is found throughout the small intestine, but has not been observed in the rectum or cecum. It is present in large numbers in the duodenum and first part of the jejunum than in the posterior half of the small intestine. The organism is located superficially to the nucleus of the epithelial cell, and is found near the tips of the villi, never in the crypts or adjacent epithelial cells. No stages of development are found in the lamina propria. The life cycle is a typical coccidial type of development. The first asexual generation is completed in two or three days. There are apparently two types of schizonts in this first generation, one quite small containing 10 to 15 merozoites, and the second much larger containing five to ten times as many smaller merozoites. The relationship of these two forms is not understood; however, they do not represent a multiple infection since the original infection was derived from a single oocyst. The second asexual generation is completed in three and one half to four days after infection. The third generation is predominately sexual, and is characterized by very large granular macrogametocytes. Mature oocysts will be found in the droppings late on the fifth or early on the sixth day after infection. A fourth generation occurs, but the infection has not been followed further than this.

The third species which occurs in the turkey is *Eimeria melagrinds* which localizes in the cecum. We have observed this species very commonly in the turkey from all sections of the United States. In our experience this organism is rather non-pathogenic, although Morehouse (1949) has noted rather severe effects associated with this infection including up to 50 per cent mortality in some test groups. However, we have observed no mortality in strains isolated from Iowa, Massachusetts, Michigan, Oregon or Utah, or interference with weight gains and only a slight transient interference with feed consumption.

The pathological picture which is presented by this species is characteristic. The first lesions are observed on the third day after infection, at which time the contents of the ceca assume a granular appearance. Three and one half days after infection the ceca are seen to be cream colored from the serosal surface, and on cross section are found to contain a non-adherent cream colored cheesy plug next to the mucosa. The center of this plug contains normal feces and the entire core may be lifted out intact. At this stage the plug may be soft and mucoid in consistency. A few petechial hemorrhages are present. Four days after infection the plug is still present and the cecal wall is slightly thickened. There are rows of numerous petechial hemmorhages in the dilated portion of the cecum. However there is no blood present in the lumen of the cecum. Five days after infection the cecal plugs seem to be resolving, and by five and one half days after infection have disappeared except for small fragments. Scattered in the mucosa at this time there may be seen small cream colored areas, 1 to 2 millimeters in diameter, which when removed are found to consist of caseous material. Seven days after infection the ceca are normal.

This species is found primarily in the superficial epithelium of the cecum, although it has been reported as occurring in the rectum and lower part of the small intestine in severe infections. The parasites are always found near the tips of the villi, never in the crypts. The first asexual generation is completed about two and one half days after infection, and the merozoites of the second asexual generation are liberated three and one half to four days after infection. The third generation is
predominantly sexual and oocysts are passed in the droppings of infected birds five days after infection. A fourth generation of both sexual and asexual stages occurs, and possibly more, but these have not been carefully followed as yet.
TREATMENT OF BOVINE TRICHOMONIASIS

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Of the 4106 cases of abortion due to infectious causes, diagnosed at the Veterinary-Bacteriological Institute over the past 10 years, Trichomonas foetus was present in 840 cases, or 20.4% of the whole.

I. DIAGNOSIS

In the female, there is generally no difficulty in establishing the presence of trichomonads, provided that the samples for examination can be collected fresh and uncontaminated. If the external temperature be high, accidental infection from other sources leads rapidly to the death of the flagellata and the presence of excrement, urine or disinfectants gravely endangers the survival of the trichomonads. They are most easily detected in the amniotic and allantoic fluid of the aborted conceptus, which is roughly the size of a mouse and pale in colour. Pyometra also often contains trichomonads in pure culture. Vaginal mucus is also particularly suitable for diagnostic purposes, especially where abortion has been recent. According to Banner Bill Morgan (2), the mucus samples should be taken within 48 hours of the expulsion of the conceptus. Hammond and Bartlett (4) examining a large number of animals, found the pattern of trichomonad fluctuations correlated with the estrous cycles. Daily inspection of freshly infected animals invariably gave positive results a few days before the recurring estrus. They recommend to collect the mucus, with aseptic precautions, either 12–19 days after coitus, or directly after premature abortion, or else a few days before the anticipated first, second or third estrus.

In the bull direct determination of trichomoniasis is considerably harder, since the trichomonads never multiply to a very great extent. The source of the flagellata is the mucous membrane of the penis and prepuce. The question, whether Trichomonas foetus attacks only the preputial cavity or—in chronic cases—also invades the urethra and accessory sex glands is of decisive importance in diagnosis and therapy.

Literature on the subject shows rare cases of trichomonad detection in the upper part of the urethra (Küst, quoted by Abelein) in the ampulla of the spermatic duct in the seminal vesicle and in the epididymis (Futamura, Karlson & Boyd, Kerr, quoted by Banner Bill Morgan). Abelein (1) examined these data concerning the presence of trichomonads in the genitourinary system. He examined, by microscope and in culture, 73 semen samples taken from 62 trichomonad-infected bulls. Abelein only determined isolated trichomonads in the semen of 2 cases, and attributes both positive findings to contamination of the samples by preputial mucus. Abelein concludes that the presence of Trichomonas foetus in the deeper sections of the urethra, in the accessory sex glands and in the testes is a rare phenomenon, if indeed it occurs at all. The data of Andrews and Miller (quoted by Banner Bill Morgan), of Feiling, Küst, de Blieck and Boos, as well as those of Möller (quoted by Abelein)
concerning detection of trichomonads in the bovine semen do not constitute any proof of ascending invasion, since, in the absence of special precautionary measures, contamination of the semen with preputial secretion is always possible. Abelein found that the mixture of urine and semen (collected by massage) was in every case free of trichomonads, provided the meatus urinarius was first cleaned with a solution of trypanflavine, before removal of the sample, and providing the samples were collected in a completely sterile condition.

In the cases of bulls examined by us, trichomonads could be detected repeatedly in the secretion of the accessory sex glands, which flows from the urethra with the penis erect, before coition. After thorough cleaning and disinfection of penis and preputial mucous membrane, the secretion, as well as the ejaculate obtained in the artificial vagina, was invariably free of trichomonads. Thereafter, we devoted our attention solely to microscopic and culture examination of the preputial secretion. Of 168 samples from the prepuce, 19 positive cases were determined by microscope and 24 by culture process. 125 cases remained negative by both methods. We have ourselves pronounced bulls, even when highly suspected by anamnesis, to be free of infection, as a consequence of negative findings from several samples examined by the culture process, and have never observed cases of subsequent infection through coition.

Localization of the trichomonads in the penis and preputial mucous membrane has been studied by Bartlett (3) in a long series of experiments. In all cases, the membrane of the collum glandis was the part most strongly infected, while the immediately neighbouring parietal membrane also revealed on an average large numbers of trichomonads. Then followed, in decreasing sequence, the galea glandis, the cranial (orifice-bordering) part of the preputial mucous membrane, and lastly the central part of the preputial ampulla. The distribution of the trichomonads corresponds with the histological structure of the different parts of the mucous membrane. The trichomonads are, as we shall later see, facultative, anaerobic membrane parasites, and prefer to settle in the deep membranous recesses. The examinations of Stoss (6) show that the cutaneous membrane of the collum glandis, in particular, is completely covered on the surface with glandular-like epithelial recesses. The galea glandis shows a smooth epithelial covering, but the deep furrows along the area where the urethra is imbedded offer favourable shelter to the trichomonads. The parietal membrane of the prepuce, with its numerous vertical and diagonal folds, also forms deep recesses, and shows, in its cranial third, lacunose epithelial depressions and niches.

Trichomonads lying in the recesses of the membranes are difficult to reach for diagnostic or therapeutic purposes. We find diagnosis is made easier by bringing the bull to a high state of libido with the help of a cow, though not allowing coition, before removing the preputial mucus. The membranous secretion, whether scraped or washed out, contains far more trichomonads after erection than before, since the turgid membrane forces out cellular detritus and secretions, together with trichomonads, from the cavities.

Technique for examination of the bull. For purposes of direct microscopic examination, it is possible, after erection, to insert a gauze tampon, about finger thickness, at the end of a metal catheter, into the preputial cavity. The tampon must be
inserted as far as the collum glandis, and filled with secretion by massage of the penis and prepuce. The more completely the retracted gauze is moistened, the more easily can trichomonads be determined in the fluid pressed out of it. In order to achieve the highest possible asepsis in removal of samples, Bartlett (3) has constructed a preputial pipette with rubber bulb.

Determination of the presence of trichomonad by culture is today a more reliable method. After careful cleansing of the preputial orifice, erection is provoked. The preputial sac is then filled with 200–300 ml of a physiological saline solution, and massaged, whereby the column and galea glandis in particular should be rubbed. The fluid extracted, which must be as clean as possible, can, in cases of high external temperature and lengthy transport, be mixed with Penicillin (according to Schneider (5) 50,000 units to 100 ml physiological saline solution). The fluid is left to sediment in a pointed glass for 1–2 hours, the bottom layer is centrifugated for 15 minutes at 2,000 r.p.m. and the deposit cultivated in serum broth tubules (diameter: 1 cm; length: 10 cm) with a covering of paraffin oil. To prevent infection by other bacteria, Penicillin in doses of 600–1,000 I.U. per ccm of serum broth is added—according to the degree of accidental contamination of the fluid.

II. EXPERIMENTS IN VITRO

The starting point of the following experiments was a particular observation of culture trichomonads. We noticed that the flagellata inhabited almost without exception the bottom of the serum broth tubes, although it is precisely their negative geotropic movement which furthers the pure culture of bacterio-infected material. The longer and narrower the culture tubules chosen, the better was the growth, and the higher the trichomonads rose in the fluid column. We confirmed this experiment by filling 20 vessels of different lumina, each with 5 ccm of a freshly inoculated and homogenised serum broth culture. As a result of the subsequent culture experiment, it was observed that the reproductive intensity increased in proportion to the height of the fluid column and the smallness of the surface in contact with the air. These differences in growth intensity could only be explained by the fact that the trichomonads in the narrower and higher tubules were better able to escape the influence of the oxygen of the air than those in the flatter and broader holders with a lower fluidic layer.

Convincing proof of the growth-impeding influence of air oxygen was produced by means of culture experiments in a nitrogen atmosphere. A homogenous inoculated serum broth culture was placed in ampules. Before sealing a surplus of sterile, oxygen-free nitrogen was added to a number of ampules in order to force the oxygen quantitatively out of the serum broth and the hollow space of the ampules. The remaining ampules served as controls. The trichomonads showed greater reproductive activity in the nitrogenous atmosphere, and, in contrast to the control cultures exposed to air influence, inhabited the serum broth in equal proportions everywhere up to the uppermost layer.

The harmful effect of air oxygen was even better demonstrated with a series of 30 ccm-ampules, which were each filled with 1 ccm of a homogenous inoculated serum broth. One half of the series was saturated with nitrogen before sealing. In order to increase the surface in contact with air or nitrogen, as the case might be,
all ampules were laid horizontally in the incubator. In the flat, 1–2 mm-deep broth, the trichomonads could not escape the effects of the gases. The experiment produced decisive results. Only 24 hours later, the control cultures no longer contained a single living trichomonad. In the nitrogen-filled ampules, it was possible to determine a prolific growth at a maximum of 3 to 6 days later, and living trichomonads were regularly found up to the 28th day.

These results led to the therapeutic experiment with nascent oxygen. Hydrogen-peroxide in 1:50,000 dilution had already shown a definite growth-impeding effect in fluid cultures. Concentrations of 1:10,000 were sufficient to kill off completely, within 60 minutes, well developed serum broth cultures after only 10 minutes contact, the trichomonads were already incapable of reproduction. The hydrogen-peroxide solution must, however, be well mixed with the serum broth by repeated shaking; when it was simply poured on in drops, the effect on the deeper lying cultures was unreliable. The killing-off times were registered by an absolute constant temperature of 37° Centigrade (98.6° Fahrenheit). Dying trichomonads examined under the microscope showed a rosette-shaped agglutination. In the microfilm (produced for us by the firm Wild at Heerbrugg by the phase-contrast process) it was possible to determine exactly the various stages of gradual death. The flagellata becomes slower in their movements, and affix themselves reciprocally by means of the free hind flagella, but never with one of the three head flagellas.

III. EXPERIMENTS IN VIVO

It was a short step from here to the utilization of these results upon the living animal. We douched several chronically-infected animals with a 3 per cent solution of hydrogen-peroxide, and at first achieved only a strong diminution of the trichomonads. Daily examination regularly revealed recurrences. The flagellata had been killed on the membranous surface, but those in the deeper-lying membrane recesses escaped the effect of the oxygen. Attempts were made to open up the membranous folds by filling the preputial sac to maximum, but here also no permanent success was achieved.

Recurrence of infection was only prevented when the hydrogen-peroxide was sprayed under high pressure on to penis and prepuce. To intensify the effect of the spraying, we mixed the 3 per cent hydrogen-peroxide solution with a non-ionic wetting agent in a concentration of 1 per cent.

For spraying, a syringe-spray with hand pump (working pressure 8–10 atm.) 120 to 147 pounds, optimum 140 pounds constant pressure was used (Fig. 1). All that we had to replace was the curved spray-tube by a straight one, and to file down the groove of the glandular jet somewhat.

The experiments showed that trichomonads are hardest to attack, by far, in the membrane of the collum glandis. It was therefore necessary to concentrate the spray jet exclusively on the hindmost parts of the preputial sac, and attempts were made to disinfect the stretched part of the prepuce by other means. A spear-shaped sponge-sheath was placed round the tube of the spray (Fig. 2). This sponge layer becomes filled with the hydrogen-peroxide solution during treatment and, by exterior pressure-massage, disinfects the parietal membrane of the prepuce. The sponge layer must be thin enough to enable the tube of the spray to be introduced easily as far
as the hindmost fold of the prepuce. In the case of stronger adhesion, the membrane is pushed backward and becomes folded, forming membrane recesses which are not reached either by the spray or by the sponge layer.

**Fig. 1**

**Fig. 2**

**IV. THERAPEUTIC TECHNIQUE**

The bull must be standing, wedged, and held firm between a strong paling fence and a revolvable pole (Fig. 3).

For spraying 10 litres (2.2 gallons) of a freshly prepared solution of 3 per cent hydrogen-peroxide and 1 per cent wetting agent is required. The fluid is sprayed on to the mucous membrane of the penis and the posterior covering folds of the pre-
puce, by means of a fine jet, at a temperature of 40–42°C. (104–107.6° Fahrenheit) and a pressure of 140 lbs. The head of the spray must be introduced as far back as possible, and continuously moved round the collum glandis, so that every part of the penis membrane is intensively sprayed (Fig. 4).

At the same time, penis and prepuce must be strongly massaged. The whole success of the therapy depends on the thorough treatment of the entire membranous surface.

However by the following diagnostic douches contusions of the mucous membrane with the rubber tube have to be carefully avoided. The bull should only be passed as free from infection when several culture experiments during the following 3–4 weeks show negative results. In case of recurrence, a second treatment can be undertaken without further hesitation.

Therapeutic Success. 20 bulls, some of them chronic cases, have been treated and all cured without exception. The bulls became free of infection after 1 or 2 treatments of the perfected technique. All the bulls were kept in the clinic for a minimum of 4 weeks, maximum 8 weeks, after the end of treatment, and inspected daily, before going back to their owners. The time allowed for these post-therapy inspections is undoubtedly more than sufficient, since all relapses appeared at the latest 8 days.
after the first treatment (Hydrogen-peroxide has only a very limited after-effect). Altogether 40–60 serum broth cultures from each bull were verified. The extensive erection before each diagnostic douche ensured that the samples contained the secretions both of the membranes and also of the accessory sex glands. The bulls so treated have been successfully used for breeding over periods of 9, 4 and 3 months since then.

Prophylaxis. To guard against reinfection in infected areas, regular douches directly after coition were ordered (douche with metal syringe, strong massage of penis with the preputial sac filled to capacity). A 1% per cent solution of hydrogen-peroxide with 1 per cent non-ionic wetting agent was used as prophylactic.

V. SUMMARY

1. *Trichomonas foetus* is a facultative, anaerobic parasite of the mucous membrane. Its peculiar sensitivity towards air oxygen is especially noticeable in the case of fluid trichomonad cultures. The flagellata flourish, in spite of their largely negative geotropic movement, on the bottom of the culture tubule. They ascend in high columns of serum solution and their reproductive intensity increases with the reduction of the surface exposed to the air. If oxygen be completely excluded, the influences of fluid height and surface extent completely disappear. In closed ampules saturated in nitrogen, the trichomonads reveal optimal growth and long life, even where the layer of serum solution is very shallow.

2. Hydrogen-peroxide in dilution of 1:50,000, by means of its nascent oxygen, exercises a growth-impeding effect; in dilutions of 1:10,000 it is capable of killing off full-grown cultures.

3. The therapy for trichomonad-infected bulls is based on the sensitivity of the trichomonad towards oxygen. It is based on the particular tendency of trichomonads to localize in the glandlike epithelial recesses of the glans penis and the mucous membranes of the prepuce. A mixture of 3 per cent hydrogen-peroxide and 1 per cent wetting agent (non-ionic) warmed to a temperature of 40–42°C. (104–107, 6° Fahrenheit) is sprayed at 140 lbs. pressure on to the glans penis and the immediately neighbouring preputial membrane. The stretched part of the preputial sac is at the same time disinfected by the sponge layer round the spray tube, which is soaked with hydrogen-peroxide.

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REPORT OF THE COMMITTEE ON PARASITIC DISEASES

D. F. Eveleth, Fargo, North Dakota, Chairman; R. L. Cuff, Kansas City, Missouri; P. A. Hawkins, East Lansing, Michigan; Benjamin Schwartz, Washington, D. C.; R. F. Smith, Indianapolis, Indiana; R. D. Turk, College Station, Texas

The material for inclusion in this report has been selected from a voluminous literature.

There appears to be a continued improvement in the efficacy of the newer types of parasiticides and insecticides. Some investigators have re-evaluated the nutritional and environmental factors on host-parasite relationship and there has also been a renewed interest in the mode of action of anthelmintics.

Immunity to parasitic diseases warrants further investigation. It is clearly established that a given species of coccidia will, when present in a host, cause that host to produce a specific and apparent immunity. Ascarids apparently act similarly but much more slowly in swine. Experiments have also shown that some roundworms, tapeworms and arthropods elicit immunological responses by the host. However, as such immunity may be limited in degree and cannot be depended upon for practical purposes, it appears that control of most parasitic diseases depends on management practices and intelligent use of parasiticides.

Accumulating Evidence of the Injuriousness of Internal Parasites. It is common knowledge that livestock suffer serious losses from the effects of a wide variety of internal parasites. On the other hand, reliable data on the specific, injurious effects of individual species are very fragmentary. Note should be taken of a few selected examples from recent experimental studies because they suggest that internal parasites as a group may be far more important than has generally been thought and because some species that have heretofore been regarded as comparatively benign may, in fact, be quite injurious. Moreover, when animals appear to be doing well, it is too often felt that the presence of a few parasites is of little concern. Controlled studies suggest that this is a costly complacency.

Attention may be directed to the evidence that the intestinal threadworm of swine, *Strongyloides ransomi*, causes significant morbidity and mortality losses. Information along this line was recently summarized by Spindler and his associates in the U. S. Bureau of Animal Industry, whose own experiments revealed that significant numbers of threadworms could largely nullify the capacity of pigs to grow. In another experimental study of ascarid infections, Spindler recorded the weight-gains of 4 parasitized and 4 unparasitized pigs during the period from 8 to 20 weeks of age. The latter showed an average gain per hog of 0.79 pound daily for 126 days. The 4 pigs that were experimentally infested with ascarids averaged, respectively, 0.72, 0.47, 0.39 and 0 pound daily and, at autopsy after 126 days, were found to harbor, respectively, 12, 20, 39 and 109 ascarids. Each adult ascarid therefore was responsible, on the average, for reducing the weight-gain by about 1 pound before the pigs reached 5 months of age. Several years ago, it was noted that about as many pigs could be marketed from 2 litters that were protected from parasites
as from 3 litters that were raised under ordinary conditions, and that the latter required a much longer time and significantly more feed to reach market weight. A recent controlled study of the effects of varying degrees of nodular worm infection on lambs showed that the infestations reduced the weight of live sheep, the weights of the pelt and organs, the amount of lean and fat in the carcass and in the chops, the dressing-out per cent, and increased the degree of shrinkage of the carcass on storage. The wool from severely infected sheep was short and dry and showed breaks in the fibers. The average weekly weight gain of moderately infected lambs was only 0.8 pound, while that of the uninfected control lambs was 2.4 pounds.

Many other studies are recorded in the literature, but they are only a beginning to the important work of ascertaining the real loss caused by parasites. Certainly, the insidious losses from this source appear to require more attention than they have been given in the past.

**Major Developments in the Use of Chlorinated Hydrocarbon Insecticides.** It is not within the province of this report to review the extensive studies that have been carried out during the past year with this large and important group of pest control chemicals. There has been great expansion in uses, applications, and formulations and some new compounds of promise have been introduced into the field. In addition to numerous toxicological investigations which are fundamental to determining the safe uses of these chemicals, researchers in both non-profit and industrial institutions have shown an increasingly healthy concern about related but more remote problems, such as the following: The possible effects of wide-spread insecticidal use upon the balance of nature—upon bees and other beneficial insects, upon aquatic and bird life, and upon plant life. Also the effect of Chlorinated Hydrocarbons resulting in the long continued exposures of human, animal and plant populations. For example, it has been found that Chlordane is excreted in the milk of cows that have been sprayed with this chemical as well as from cows that have eaten feed that had been sprayed with Chlordane.

Note may be taken only of certain developments that are of major concern to livestock officials and sanitarians. Chief among these was the official decision last March that DDT should not be used on milk cows, in dairies, or on feeds for dairy animals. The decision was not prompted by any instance of injury to human health, but rather, by recognition of the potential risks of long-continued ingestion of the chemical. The presence of DDT in milk would be contrary to the Food, Drug and Cosmetic Act. At the time of this action, it was recommended that fly control be achieved through more vigorous measures against fly breeding and through the use of other insecticides, notably methoxychlor, synergized pyrethrum, and the thiocyanate space-sprays. More recently, Lindane, the commercially pure gamma isomer of benzene hexachloride has been used effectively, and is possibly safe, though not yet advised, for dairy cows. In this case, as with certain other possible substitutes, there are unsolved problems involving the secretion of the chemical in milk or its deposition in tissues and possible effects of the chemical on the odor and taste of the milk. There is, of course, possible effects of these drugs on human health. Much progress along these lines is certain to mark the coming year. Another significant development is the increased trend toward the use of pure gamma BHC (Lindane) in lieu of the crude compound for all applications where there is risk to either
human or animal health. Some uses of the technical BHC, such as those cited elsewhere in this report, are considered entirely safe as well as effective and the substitution of Lindane in such cases might be quite uneconomical.

There have been numerous reports from the field that DDT sprays have failed in the elimination of horn flies, house flies and some other flies. DFDT (a fluorine analog of DDT) has in some instances proved very effective against fly populations that appeared resistant to the ordinary DDT sprays.

Single-treatment Eradication of Sheep Scab. One dipping in suspensions containing 0.06% gamma benzene hexachloride has been found to be effective in eradicating scab mites and curing mangy sheep. This simple, reliable dip should assist materially in cleaning up scab on the farm and range. 100 gallons of dipping fluid may be prepared with 8 pounds of wettable BHC containing 6% gamma isomer, or with 2 pounds containing 24% gamma, or with other commercial products of BHC in similarly proportioned amounts. All animals of infested flocks should be immersed for at least 2 minutes. Ordinarily, it is most economical and convenient to carry out the dipping operations about 2 weeks after shearing, although severely affected sheep should be dipped as soon as possible after detection of the condition regardless of time of year or thickness of fleece. This dip has many advantages over the older, official dips prepared with lime-sulfur or nicotine sulfate, especially since the latter two require 2 dippings at a specified interval of 10 to 12 days. It is not yet permissible to use the new dip for the official treatment of scabies-infested sheep destined for interstate shipment. Due to the fact that no vat-side test has been perfected for determining the strength of the dip.

It has long been known that such dips are not bactericidal; as a matter of fact, reports from New Zealand have shown that sheep infected with Erysopelothrix rhusiopathiae contaminated the dip so that sheep dipped at a later date were infected with the cutaneous form of the disease.

Improved measures against Cattle Fever Ticks. The development of the combined DDT-benzene hexachloride dip for the destruction of fever ticks (Boophilus annulatus) provides an improved weapon for combatting ticks and tick-borne diseases, and gives added assurance of protection against the introduction of such pests and the diseases they transmit. It is noteworthy that this formulation, applied as a spray or dip, may be promising for the control of horseflies. The new dip is safer and more effective than the officially recognized arsenical dip, and protects against reinfestation for 3 to 5 weeks. This dip is prepared by mixing wettable 50% DDT and wettable 50% BHC (having about 6% gamma isomer content) with water, at the rate of 8 pounds of the former and 4 pounds of the latter for each 100 gallons of dip. Standardized concentrates, containing these chemicals in exact proportion and properly combined with wetting and dispersing agents, are already commercially available. Whether or not the suspension can become officially sanctioned for the dipping of animals destined for immediate shipment must await development of a practical vat-side test for determining the strength of the mixture under varying conditions. The cattle fever tick has been eradicated from Texas, but due to its wide prevalence in Mexico constant supervision and inspection is maintained along the border. It is reported that the tick has crossed certain quarantine lines in Florida and is now present in one county in Georgia.
Liver Fluke Control. One may state the liver fluke infestation continues to be a grave problem in those areas where conditions for completion of the flukes life cycle are satisfactory. Flukes may be controlled by medication with hexachloroethane but medication will not eliminate the flukes because all flukes are not removed and certain wild animals, for example rabbits and deer, are reservoir hosts. The only method of control that will eliminate flukes is snail control, particularly by improving pasture drainage. In many areas, particularly in the Gulf Coast region, a considerable amount of time and money would be required to establish and maintain drainage ditches, and should be a cooperative project on the part of land owners. Copper sulfate may be used to destroy snails in drainage ditches, streams and small pastures but does not appear to be practical in the control of snails over large areas.

At present, the hexachloroethane suspension as prepared by Olsen, consisting of 500 grams hexachloroethane, 50 grams bentonite, \( \frac{1}{2} \) to \( \frac{1}{3} \) teaspoonful white flour and water sufficient (about 750 cc) to make 1000 cc., is recommended as medication for the control of liver flukes in sheep and cattle. Sheep are given 1 fluid ounce (30 cc) of the mixture. Mature cattle receive 6 to 7 ounces (200 cc).

Ox Warble Control. It was established some years ago that rotenone applied to the backs of cattle infested with the larvae of the warble flies, *Hypoderma spp.*, caused the death of the larvae. More recent studies from Oklahoma have shown that the summer spraying of beef cattle with rotenone increased the rate of gain in weight and also decreased the number of larvae that migrated to the backs of the cattle the following spring.

Piperonyl Butoxide. Piperonyl Butoxide is one of the newer chemicals offering considerable promise both as an insecticide and as an insect repellent. This chemical, when mixed with pyrethrins has been found useful in ridding hogs and cattle of lice.

This same combination appears to increase the larvacidal action of Smear 62 against screw worm larvae. It is reported that piperonyl butoxide and pyrethrins act both as a lethal factor and a repellant for the common horse flies (*Tabanus spp.*).

The toxicity of piperonyl butoxide for mammals appears to be low.

Phenothiazine. Phenothiazine in low dosage (salt licks) still appears to be very effective in preventing development of eggs of certain round worms. Most investigators report a high degree of efficacy when therapeutic doses are given. There are, however, a few reports that would indicate that in some sheep flocks the parasites are becoming phenothiazine resistant. This problem definitely warrants further investigation. It is reported that small, frequent doses of phenothiazine are highly effective in controlling strongyle infections in horses.

The Use of Arsenates Against Tapeworms in Ruminants. Nicotine arsenate or sodium arsenate appear to be equally efficacious to lead arsenate as a parasiticide against *Moniezia spp.* In much of the Northwest territory the water is very high in sulfates. In these areas lead is readily precipitated in the rumen and exerts no further action as a parasiticide.

The use of arsenates for eliminating tapeworms has raised the question of arsenic storage in the liver. Critical studies made on lambs have shown that most of the arsenic is eliminated from the liver in 15 days.

Coccidiosis. Recent advances in our knowledge of coccidiosis in the domesticated
animals were presented at a conference sponsored by the New York Academy of Science. At this meeting Foster presented tentative estimates on the losses produced by the disease, however he pointed out the need for the collection and publication of adequate data. He concluded that the annual losses from this disease were as follows: calves $10,000,000; poultry $10,000,000; sheep $1,000,000. We feel that these estimates are quite conservative, particularly in the case of poultry.

Tomhave studied the effects of litter moisture on outbreaks of cecal coccidiosis in chickens and observed that the losses from this disease increased directly with increased in water content of the bedding. Farr and Wehr found that oocysts of *Eimeria tenella* remained viable on the soil at Beltsville, Md., for as long as 11 months, those of *E. acervulina* 12 months and oocysts of *E. maxima* for 9 months. Kennard and Chamberlin observed a mortality of 19 per cent from coccidiosis and other causes during a three year period in 18,735 unmedicated birds when the chicks were started and raised on fresh, clean litter. This is in contrast with a mortality of 7 per cent in 7,140 birds which were started and raised on old built up floor litter. This work indicated that certain factors are available in the old built up litter which acted to reduce losses from coccidiosis and other causes.

Seeger examined a number of agents which are used in the treatment of coccidiosis in poultry and found only seven to be effective as follows: sulfamethazine, sulfamerazine, sulfaguanidine, chlorosulfadiazone, sulfadinoxaline, sulfapyrazine and nitrophenide. Those which were found to be effective as a preventive were N-1 benzoylsulfanilamide, sulfanilylamidophenyl-arsenoxide, and "SX". Other common poultry remedies tested were found to be less effective than those named above. The list included: sodium phosphate phenothalein ("Anticocci"), sulfauaqanidine in HCL ("Sulfadine"), Calgon, sodium borate-urea-glycerin-water ("Blacktol"), sodium arsanilate tablets ("Mayfields"), protein hydrolysate and lactide ("Vitalac"), nitrofurazone ("NFZ"), "Renosal", dried whey, copper sulfate and epsom salts.

Waletzky and Hughes have introduced nitrophenide (m,m'-dinitrodiphenyldisulphide) as a suppressive agent for the control of cecal coccidiosis. They observed that concentrations of 0.01 to 0.04 per cent in the feed will give satisfactory results. This compound is approximately ten times as active as sulfauquanidine and exhibits a considerable margin of safety.

Johnson, Mussell and Dietzler have demonstrated that certain bisphenols have marked coccidiostatic activity for the control of moderate coccidial infections and Hawkins and Dunlap have demonstrated similar results against severe infections. One of the most effective of this group, 4,4'-isopropylidene-bis(2-isopropylphenol), controlled single and repeated infections when fed in the mash at concentrations of 0.2 to 0.3 per cent. Continuous medication with this compound did not interfere with the rate of growth and efficiency of feed utilization of broilers.

Recent knowledge concerning coccidiosis in turkeys is being presented in another paper at this meeting by Hawkins and will not be further discussed here.

In the past year there have been very few contributions to our knowledge concerning coccidiosis in the other domesticated animals. Davis and Bowman have shown that sulfamethazine is of value for the treatment of calves infected with *Eimeria zurnii*, or with mixed infections. They administered the drug for four consecutive
days beginning one week after infection and noted that the symptoms were less severe and that the treated group gained 50 per cent more than did those which were unmedicated. They also noted that three or four courses of treatment gave better results than did one course.

Dunlap and Hawkins have studied the course of naturally acquired coccidial infections in lambs. They observed a marked resistance to infection in the ewes as compared with their lambs, with the older sheep acting as carriers of the infection and the lambs as "multipliers." They also observed that there was a correlation between the increase in atmospheric temperature and the time at which the coccidial infection was noted in the lambs.

**In Vitro Studies of Parasiticides on Ascaris lumbricoides.** Trim has recently shown that the rate of penetration of various drugs into ascarids, with ligatures around both the anterior and posterior portions of the body, was greatly influenced by the chemical structure of the anthelmintic. A series of 4 N alkyl resorcinols showed a typical homologous series effect. Nicotine penetrated at a relatively slow rate and was influenced by its dissociation into its basic groups. The rate of nicotine penetration was influenced by the presence of surface-active substances. Chloroform was the most rapidly acting agent investigated. The author concluded that the cuticle or another protective layer was the main barrier to penetration.

**Relation of Nutrition to Parasitism.** Whitlock has shown that the plane of nutrition not only influences the extent but also the type of parasitism in lambs. Karmen, however, found that lice on rats fed vitamin A, thiamine, riboflavin and pantothenic acid deficient diets, failed to increase in number. When the fur was lost the lice disappeared.

In the case of chickens, normal birds were compared with those on a slightly low vitamin ration and on a very low vitamin ration. All were experimentally infested with lice. There was no difference in the extent of pediculosis in the normal and slightly deficient birds while those showing severe malnutrition had a significantly lower degree of infestation.

The results of these two authors indicate that further investigational work must be done on the various types of hosts and their internal and external parasites in order to determine the effects of nutrition on the host-parasite relationship.

**The Dissemination of Parasitic Diseases.** The dissemination of parasitic diseases from area to area will always be a factor to consider in effective control measures against any particular disease.

Recent investigations in Texas have shown that the white tailed deer in that state show a high degree of infection with the fluke, *Fascioloides magna*. It is pointed out by the authors that trapped deer are often shipped to other areas for replacement stock and that if the necessary intermediate hosts were present the disease would be established in the new area.

There are many factors to consider in fluke and tapeworm ecology. The importance and necessity of the intermediate host in certain types of tapeworm infections can be illustrated in the following case: The fringed tapeworm, *Thysanosoma actinoiides*, is a parasite of economic importance in most of North Dakota. During the past six years a small pasture with sheds has been maintained in Fargo for parasite studies
on sheep. Many sheep that were heavily infected with fringed tapeworms have been placed on this pasture. In no case has it been possible to demonstrate fringed tapeworms in lambs raised on this pasture. However, fringed tapeworms have been found in lambs raised on a sheep farm 45 miles east of Fargo, North Dakota.

The establishment of irrigation projects in the Missouri-Mississippi plains area may produce environmental conditions that will result in the introduction and establishment of the intermediate host for the fringed tapeworm of sheep and the flukes of all ruminants.

REPORT OF THE COMMITTEE ON POLICY 1941


Your Committee on Policy has attended to their duties and wish to make the following recommendations for your consideration:

1. We recommend that the Executive Committee of this Association give further consideration to the recommendations of this Committee as set forth in the report of the proceedings of 1940.

2. We recommend that the officers and active members of the U. S. Live Stock Sanitary Association lend every effort to procure a more definite and stable membership, and that measures be taken to collect yearly dues from all members.

3. That methods of publicity be adopted whereby members of the Veterinary profession in good standing and other interested persons may be informed of their eligibility for membership in this Association.

4. Your Committee recommends that a policy of procuring proper paid advertisements to be run in our Annual Report, be adopted if and when, in the opinion of our officers, such a policy would prove to be of sufficient benefit to warrant the effort.

5. It is further recommended that the Committee on Policy be appointed by the President of this Association in the following manner:
   a. The Committee shall consist of five members.
   b. The members shall be selected from different geographical sections of the United States.
   c. One member shall be selected from the ranks of the Bureau of Animal Industry; one member shall be a layman and three members shall be selected from the ranks of the regulatory Live Stock officials of the respective states, in good standing.

6. Your Committee further recommends that all matters of policy and all recommendations made by members of this Association be referred to the Committee on Policy, whose duty it shall be to study, prepare and present for the consideration of the Executive Committee, all policies of a general nature affecting this Association.
REPORT OF THE COMMITTEE ON POLICY

T. C. GREEN, Charleston, West Virginia, Chairman; E. P. ANDERSON, Lincoln, Nebraska; J. G. HARDENBERGH, Chicago, Illinois; J. V. KNAPP, Tallahassee, Florida; C. E. KORD, Nashville, Tennessee; I. S. MCADORY, Auburn, Alabama

Your committee on policy has attended their duties and wishes to make the following recommendations for your consideration.

First: We recommend that the officers and members of this association give more consideration to the recommendations of your committee reports on policy recorded in the 1940 and 1941 Proceedings.

Second: Whereas it has come to the attention of this committee, that on numerous occasions your various committees when in session in their respective committee rooms, have been interrupted by visiting members of this association desiring to be heard and whereas such interruption retards the progress of your committees, we recommend that any member of this association desiring to make suggestions to a committee do so by presenting his suggestions in writing to the chairman of the proper committee. We further recommend that it be the policy of this association to permit no one other than committee members to discuss subject material from the floor of the committee room unless requested or permitted to do so by the chairman of the committee.

Third: Whereas it has come to our attention that on many occasions members of this association have engaged in verbal debates on the floor of the general assembly without first being recognized by the chair and thereby causing much confusion, we recommend that this Association conduct its order of business in accordance with the provisions set forth in its constitution and by-laws and in conformity with parliamentary procedure.

Note. The report of the Committee on Policy for 1940 and 1941 essentially are the same. For reference see the reprint of the 1941 report on page 134.
REPORT OF THE REPRESENTATIVE TO MEETING OF THE NATIONAL ASSOCIATION OF COMMISSIONERS, SECRETARIES AND DIRECTORS OF AGRICULTURE

Representatives: E. P. ANDERSON, Lincoln, Nebraska; A. K. CARR, Sacramento, California; R. A. HENDERSHOTT, Trenton, New Jersey

Alternates: T. C. GREEN, Charleston, West Virginia; J. R. LUDWIGS, Fort Worth, Texas; R. W. SMITH, Concord, New Hampshire

DR. HENDERSHOTT: You will recall that a year ago we had a request from the Commissioners, Directors, and Secretaries of Agriculture that we appoint a Committee to meet with the representatives of that organization. President Brandenburg appointed three delegates and three alternates. It was my pleasure to be appointed one of representatives of the Association, to attend this meeting.

In attendance at the meeting, which was held in the Hadden Hall at Atlantic City, September 26 through 29, last, were four State Veterinarians. It should be said that the Directors, Commissioners and Secretaries for agriculture, while they asked for a Committee to represent this Association, also issued an urgent invitation to all the state regulatory officials to attend their sessions, and at the meeting in Atlantic City, there was Dr. Breek from Kentucky, Dr. E. P. Anderson from Nebraska, and Dr. C. E. Kord from Tennessee, as well as the speaker.

At this meeting, they had Committees such as we have here. For example, they had a Committee on Animal Industry which was under the Chairmanship and guidance of Commissioner Button of Wisconsin. They had several meetings and we were invited to sit in and advise with them in regard to resolutions that they were preparing on animal industry and diseases and conditions.

They also had a panel discussion. Subject matter was listed in their program as Livestock Diseases of Economic Importance. That took in a whale of a wide field, I thought, and with a fellow like Commissioner Button in charge, you were always in a quandary, on an uneasy seat, because one did not know just what he might do. He seemed to take a delight in keeping you on an uneasy seat. Dr. B. T. Simms and I were assigned to this particular panel. Dr. Simms found he couldn't attend and he sent his first-class representative, Dr. S. O. Fladness, and he and I tried to nail this fellow down and find out what we were to cover.

He said, "Never mind, we will talk about some diseases."

There we were. There was also on this panel Dr. Peterson of Oregon and Harry Waters, Commissioner of Agriculture of Kentucky, and Burley Fitts, Commissioner of Agriculture in New Hampshire.

At the Committee meeting, there were a number of resolutions passed upon by the Committee, and later on adopted by the Association. You might be interested in knowing what they were. Here was one of the resolutions:

Be it resolved by the National Association of Commissioners, Directors, and Secretaries of Agriculture that we urgently recommend that control research and treatment of brucellosis be carried out by the United States Department of Agri-
culture, Bureau of Animal Industry, independently or in cooperation with research agencies in the states that carry on such experimentation.

This would be research study with: (A) New antibiotics and other drugs that might have promise. (B) Mucoid vaccine, to determine its value in control of brucellosis and safely from the standpoint of human infection. (C) Re-vaccination of animals and vaccination of adult animals (D) The study of the proper avenues of administration of vaccine other than subcutaneous route to determine the most effective method of vaccine application. (E) Methods of differentiating through the application of a practical test between reactions resulting from infection with brucella organisms and those resulting from vaccine.

Another resolution was: Be it resolved that the Secretary of the United States Department of Agriculture be requested to amend the Bureau of Animal Industry Rule 309 so as to include in it a regulation prescribing appropriate restrictions on the interstate movement of cattle with respect to brucellosis similar to those contained in Regulation 7 of that Order pertaining to tuberculosis, and

Be it further resolved that the National Association of Commissioners, Directors, and Secretaries of Agriculture request the Congress of the United States to amend the animal quarantine law so as to provide any additional authority that may be necessary for the Secretary of Agriculture to promulgate such a regulation.

They had one on the sale of vaccines that reads as follows:

Be it resolved that the National Association of Commissioners, Directors, and Secretaries of Agriculture request the Congress of the United States to amend the Livestock Disease Control laws which will permit the Secretary of Agriculture or the Department of Agriculture to promulgate rules and regulations requiring manufacturers and distributors of sera, vaccines, viruses and toxins to render concurrent reports to the chief livestock sanitary officials at the state of destination covering the sale and distribution of all products herein mentioned.

Another resolution: Whereas the control of the livestock diseases is one of the most serious problems confronting the livestock industry today and,

Whereas proper regulation of the interstate movement of livestock is one of the most important factors in controlling livestock diseases and

Whereas there is a wide variation in regulations covering the interstate movement of livestock among the various states and

Whereas uniform regulations between states are very desirable and would assist in the disease control, and

Whereas it is very difficult to secure uniform regulations among the states on a nation-wide basis or even among regional groups of states due to the differences in local conditions,

Now, therefore, be it resolved that the National Association of Commissioners, Directors, and Secretaries of Agriculture respectfully request that those states that have not adopted the uniform health requirements as recommended by the United States Livestock Sanitary Association in 1944 give serious consideration to the adoption or adjustment of their laws in conformity with the recommendations of the United States Livestock Sanitary Association.

They had one, the last one, on brucellosis control.
Whereas brucellosis constitutes one of the widely disseminated diseases of bovine animals, and

Whereas substantial efforts have been made by the United States Department of Agriculture, Bureau of Animal Industry to control this disease looking towards its eventual eradication, and

Whereas the Brucellosis Committee has, on behalf of the United States Livestock Sanitary Association, recommended a program for control of brucellosis and its eradication,

Now, be it resolved by the National Association of Commissioners, Directors, and Secretaries of Agriculture that it commend the efforts which have thus far been made by the United States Department of Agriculture, Bureau of Animal Industry, and the Brucellosis Committee of the United States Livestock Sanitary Association, and

Be it further resolved that this Association recommend continued studies by the United States Bureau of Animal Industry, and the United States Livestock Sanitary Association for the purposes of reaching the most practical and effective methods of control of brucellosis, having as its ultimate object the eradication of this disease.

I might say that we had a very enjoyable time following the report of this Committee when we had our panel discussion, and Dr. Fladness was asked to open the discussion after a few remarks, but Commissioner Button and he talked on the method of setting up the cooperative agreements between the Federal Government and the various states in looking toward the control of infectious communicable diseases, particularly tuberculosis and brucellosis.

Later on, the question was thrown open for discussion on brucellosis with particular reference to vaccines and many questions were asked with regard to the use of Strain 19. Following the discussion along this line, Commissioner Figgy of Michigan, was called upon from the floor to tell something about the use of mucoid vaccine in the State of Michigan.

This immediately brought forth a query why there was a restraint upon the interstate movement of mucoid vaccine. The ball was tossed over to me to reply and I endeavored to represent you by saying that we, too, were anxious—to see the status of the vaccine entirely cleared, but that I felt that with all regulatory officials that we carry a terrific responsibility to the livestock interests that we represent, and in no way could we approve a product until beyond question of doubt it had been proved to be worthy, and that it was my feeling, and I thought the feeling of many of us, that there has not been enough controlled research done with regard to mucoid strain of vaccine to provide the answer that we need before we are willing to have it distributed in interstate commerce to all the states of the Union.

This seemed to satisfy them. I think it cleared the atmosphere a little bit, though I heard some side comment afterwards that several of the Commissioners felt it was high time that the Bureau of Animal Industry conduct a check on this vaccine. That, again, I tried to straighten out on behalf of the Bureau by pointing out that cooperation is a two-fold reversible reaction type of thing, that two people must agree to do certain things before you have cooperation.

I might say that we had a delightful meeting in Atlantic City. The Standard Oil
Company of New Jersey entertained us royally on the first evening on Monday with
a wonderful dinner and some gifts to those in attendance.

At the end of the second day meeting, those that desired to do so, particularly in-
landers were given a boat ride out on the ocean. It so happened that it was pretty
rough that day, and I was afraid to trust my underpinning. I was also afraid of
trusting some of the innards of some of our landlubbers. Fortunately, they made
a skirting trip around the Atlantic City, and came into the bay which was compara-
tively calm. They were not out very long but long enough to say they had been
out on the ocean.

On Wednesday, following the morning session, we visited the Seabrook Farms in
Bridgeton, New Jersey, who are the processors and producers of the Birdseye Fast
Frozen Food Products.

That evening, we were entertained by the Agricultural Society of New Jersey at a
banquet in the Hotel and I think everybody was very well pleased with the whole
affair.

I might say, too, that the Commissioner of Maine provided us with a package of a
dozen of their best Macintosh apples wrapped up in paper. The Commissioner of
Wisconsin provided us with a couple of bites of cheese, and Commissioner Figgy
sent down a carload of canned cherries that went like hotcakes, and the Commis-
sioner Swisher, of Colorado, very kindly airmailed in some of the delightful carna-
tions that are grown at high altitude in that State.

I think all in all those in attendance went home with a kindly feeling both toward
the Commissioners and those that entertained them.

It was a pleasure for me to represent our Association there. I think it is a good
liaison, and I, in turn, invited all the Commissioners to attend our sessions here and
at the expense of the Association, provided each with a copy of “What Is Known
About Brucellosis.”

Everybody seemed to be giving something away and I felt that we didn’t want to
be out of that particular type of picture. They were readily taken and many ques-
tions were asked relative to what practical distribution and use might be made of
them. As far as we could, we tried to give the answers. (Applause)
A REPORTING SYSTEM FOR COMMUNICABLE DISEASES OF ANIMALS

L. E. Starr, D.V.M., MSc., Ph.D.

Looking back through the proceedings of the U.S. Live Stock Sanitary Association, we note that the committee on Miscellaneous Transmissible Diseases made an abrupt change in 1945. In 1944 the committee reported on the geographical occurrence and severity of foot and mouth disease, equine encephalomyelitis, vesicular stomatitis, foot rot, infectious keratitis, vesicular exanthema, mastitis, coccidiosis of feeder lambs and giardia intestinalis with a line or two devoted to each of thirteen other diseases. This report was largely a very brief summary of the U.S. Bureau of Animal Industry report.

In 1945 under the chairmanship of Dr. Schroeder, the report of the Committee on Miscellaneous Diseases was devoted almost entirely on the need of the establishment of a reporting system on animal diseases. This committee has continued to stress better knowledge of vital statistics which is only possible through a workable reporting system. The committee on Vital Statistics of the American Veterinary Medical Association in its 1944 report recognized the problem as one of sound agricultural economics but stated that the development and establishment of a working organization for collecting vital statistics was beyond the facilities of the American Veterinary Medical Association office and personnel.

The medical profession has a reporting system on vital statistics which is well organized and functions very effectively. This system operates within the State Public Health organization and varies somewhat in detail in each state. In the State of Georgia, most of the counties operate under a local health office, which may include one, two or three counties all being subject to the general supervision of the State Health Department. Forty-eight diseases are listed by law as reportable. These are printed on cards which are franked under the authorization of the Federal Security Agency, Public Health Service. In cities or counties operating under a health office the cards are mailed by that office to all practicing physicians in the city, county or counties in its jurisdiction. After filling in the required information, the physician mails the card to the local office where the data is transferred to a printed form sheet and a copy is sent to the collaborating Epidemiologist of the State Health Department. In counties without an organized health department, the cards are mailed from the office of the State Epidemiologist. A summarized report of all the data reported is forwarded by the collaborating Epidemiologist to the U.S. Public Health Service in Washington. Here the reports are tabulated for the country as a whole and released for distribution, copies being sent to state and other interested agencies.

In connection with our work as Public Health Veterinarians in the Division of Epidemiology, Georgia State Department of Public Health, it was imperative that we have definite information on certain important diseases of animals in the state. Since no organized systematic effort had ever been made before on a state-wide basis with practicing veterinarians we did not know what the response would be,
particularly since it would be on a purely voluntary basis. We decided to start with one disease with which the profession was vitally interested, i.e., rabies.

Double perforated post cards were printed. One card had a series of questions to be answered by the veterinarian on one side and return address on the reverse side. The other card was run through an addressograph machine, the free edges of the two cards clipped together and then mailed. The collaborating veterinarian was asked to fill in the questionnaire, sign and mail the card. The cards were mailed to arrive at the veterinarians office by the first day of each month.

This reporting system was started in January, 1946 and with modifications is being continued to date. We continued this form until the spring of 1948 when because of the very satisfactory response we decided to enlarge its scope to include other diseases. We thought it would enhance its prestige to have the cards franked rather than use ordinary printed government postal cards as in 1946 and 1947. Franking privileges were obtained and in addition to rabies, information on erysipelas, brucellosis, tuberculosis, actinomycosis, trichinosis, anthrax, equine encephalitis, leptospirosis and others was requested. These cards are run through an addressograph machine, put in a franked window envelope and mailed to each practicing veterinarian during the last week of each month.

A summary of the reports is prepared in January of each year and are mailed to all veterinarians for their information. This was conducted on a purely voluntary basis but the response has been excellent and the information received has been invaluable to us. As would be expected some paid no attention to the cards, some of these responded to a letter or personal call by one of us asking for a report and a very few never have made a report. In order to check on the reports and compile the data, two mimeographed sheets were prepared. One of these was ruled horizontally with vertical columns, one for each month. The veterinarians names were listed alphabetically. As the return cards are received, they are checked in the column opposite his name by months. We know at all times who is reporting and who is not. The information reported on the cards is transferred to other mimeographed sheets and recorded by counties for each disease. The results give us fairly dependable information on the incidence of the major diseases of interest to the department of health in most of the counties in the State.

It is not accurate from the standpoint of individual animals involved in any disease but enables us to determine the presence of any mass infection or any indication of a potential epidemic. In comparison to human vital statistics those pertaining to animals never can be accurate. Actually veterinarians never see or know of the death of many animals in their territory, therefore, these deaths will never be of a reportable nature. Veterinarians in the course of their practice have the most reliable information of anyone in their territory with respect to animal disease, however, their reports will almost always be an understatement of the actual conditions.

The following may serve as an example of the inadequacy of our reporting system on rabies as operated at present. The number of positive animals based on laboratory examination are reported to the U. S. Public Health Service each week by the State Department of Health. During January, February, March and April 1949, the following animals from Crisp, Dooley and Wilcox Counties were reported positive
by laboratory examination; 20 foxes, 6 dogs, 5 cattle, 5 cats and 1 goat or a total of 37 head of all species. However, in that same area and time period, 160 cattle, 10 mules, 4 cattle, 4 goats and 4 dogs totalling 182 animals are known to have died of rabies. Even this represents only a part of the actual cases in domestic animals.

It is compulsory by law for physicians to report certain diseases, and every human death must be reported with the cause of death. Physicians have become accustomed through the years to make morbidity and mortality reports. This is not true with respect to veterinarians but our brief experience in Georgia since 1946 leads us to believe that veterinarians would be just as cooperative as other professional men. To make such a program effective, it will be necessary to provide certain services which are of value to veterinarians, physicians, live stock regulatory and public health officials. As an example, few or no cases of equine encephalitis had been reported in Georgia by the Bureau of Animal Industry for a number of years although we were sure it was present, with possibly some human cases. In 1948, we asked for information on equine encephalomyelitis. A special encephalomyelitis kit containing two bottles was prepared and mailed to all veterinarians in counties along the lower Alabama and Florida lines and the coast of the Atlantic Ocean. One bottle contained sterile 50 per cent glycerin and the other 10 per cent formalin. An instruction sheet was enclosed asking veterinarians to make autopsies of suspected cases of the disease, place sections of the brain in each bottle and to forward the kits with blood samples to us for laboratory examination. Arrangements had been made with the Virus Research Laboratory at Montgomery, Alabama to conduct the laboratory examination. As the result of this we established proven equine encephalomyelitis, eastern strain, in nine counties with a total of 41 cases. In Burke county a mild epidemic was known to exist in one community. The known presence of considerable equine encephalomyelitis in the State stimulated the medical profession and particularly the Epidemiology Division of the State Health Department to consider the possibility that some of the atypical poliomyelitis or encephalitis cases of unknown etiology might be of equine origin. This year three human cases of encephalitis in children were reported, two of them as tubercular encephalitis on the death certificates. Investigation by personnel of the Epidemiology Division, revealed that there were a number of cases of illness and death, with symptoms simulating encephalitis, in the horses in the immediate vicinity of the children's homes and that these children probably died of equine encephalomyelitis. This was confirmed in one of the three children. Information of this type with coordinated investigation by physicians and veterinarians is extremely valuable to all concerned.

In view of our limited experience, I wish to make the following observations and suggestions for thought and discussion.

The U. S. Public Health Service lists 48 reportable diseases on their reporting card. The number of animal diseases which should be reported include those common to domestic animals, certain species of wild animals and birds, dogs and domestic fowl. This would be quite a large group but by careful study the total number could be kept at a reasonable minimum. If the questionnaire covers too large a group of diseases or conditions it would be burdensome to the practicing veterinarian and thus defeat its purpose. Certain selected diseases should be reportable by law.

Practicing veterinarians will cooperate with securing data on Vital Statistics of
animals. Its success will depend, however, on organization and provision on the state level for getting this information back to the veterinarian in such a form that it will be of interest and value to him. Better facilities should be provided to assist the veterinarian in diagnosis in those cases where laboratory examination is necessary.

It is not necessary to establish a new Bureau or an elaborate organization in Washington. It could be incorporated in an already established organization in the U. S. Department of Agriculture, preferably the Bureau of Animal Industry. The central agency in Washington should have overall supervision, assemble the data as received, get it in proper form for reporting to the various state agencies, preferably the State Veterinarian. Whether it will be of value depends largely upon the initiative, tact and energy of the state agency concerned. In our opinion, he is the key figure just as the State Epidemiologist is the key figure in human vital statistics, but the actual source of information will be the practicing veterinarian.

Addressed, franked cards should be prepared by the Washington office for use by the state agency in each state. These would be mailed by the state agency each month to all practicing veterinarians in the state. Adequate educational and follow-up work will be necessary. As the cards are returned to the State office the data could be summarized by state or counties by an experienced veterinary pathologist who is familiar with existing conditions in the state and forwarded to the Washington office for final tabulation and reporting. This data should be reported back to the individual states and thence to the practicing veterinarians for their information. This will increase the duties and responsibilities of those on the state level and will in some cases require additional professional and secretarial assistance but the information would enable their offices to function with a much greater degree of efficiency.

There should be close liaison between the Federal and State Health and Agricultural Departments in matters of policy, diseases reportable and particularly the free interchange of information. Many of the infectious diseases of animals are of vital importance to human health. Reliable data on the absence or presence of specific infectious diseases of animals is of tremendous interest to the medical profession and particularly to the State Departments of Health. It was the absence of such data which led us to initiate a reporting system. We realize that ours is very limited and inadequate and would welcome the Federal and State Departments of Agriculture taking it over. We realize now that it was an error to put ours on a franking basis under the U. S. Public Health Service because their interests are confined strictly to human health and we had to delete all questions pertaining to agricultural economics.

Adequately financed and staffed regional laboratories devoted entirely to virus research are greatly needed. Viruses of man and animals are very closely related, in fact the same virus or group of viruses may attack both man and animals constituting a problem common to human and veterinary medicine. Adequately equipped and staffed regional virus disease laboratories which would be available to both the veterinary and medical professions for diagnosis and research in connection with known or presumed virus diseases are greatly needed.
EXPERIENCES COVERING TWO YEARS OF ANIMAL DISEASE REPORTING

MARTIN D. BAUM, D.V.M., M.P.H.

Colorado State Department of Public Health

On September 1, 1947, the Colorado State Department of Public Health created in its Division of Preventive Medical Services, a section on Veterinary Public Health. The primary function of this newly created section was to study those diseases of animals which were transmitted to the human population, recommend and administer control measures, make epidemiological investigations and serve in an advisory staff capacity with other members of the medical branch of the organization.

A careful study of available data indicated that the Department had no record of what diseases of animals occurred in the State, much less the incidence or location of such diseases. It was evident that no progress could be made without such information, so the establishment of a reporting system was undertaken. The State Board of Health promulgated regulations making six animal diseases reportable to the Health Department, namely, anthrax, glanders, equine encephalomyelitis, leptospirosis, swine erysipelas and rabies. Several other diseases, such as brucellosis and tuberculosis, could have been included in this list but were intentionally omitted because of the availability of these data from other sources. Adult vaccination, with strain 19, has rendered bovine brucellosis statistics inaccurate from the standpoint of the Health Department. Tuberculosis data is available from the Bureau of Animal Industry offices and from the post mortem reports of the abattoirs of the State.

Following the adoption of these regulations, the Division of Public Health Methods of the U. S. Public Health Service granted permission for the printing of reporting cards, with franking privilege, to be used for official reporting by the veterinarians in the State. These were printed on blue stock to facilitate separation from the human disease cards in the tabulating room and the division of epidemiology. Following tabulation, they are returned to the Veterinary Public Health Section for study and investigation.

Each veterinarian in the State was furnished a supply of these reporting cards with full instructions as to use. When a reportable disease was diagnosed, all that was required was the name of the disease, name and address of the owner of the animal, human contacts, city and county of occurrence and the veterinarian reporting. This is to be mailed, without postage, to the “Collaborating Epidemiologist, State Department of Public Health” in Denver. Each disease is coded in the tabulation room and punched on an I. B. M. machine for future statistical analysis.

It will be realized that one veterinarian in a state health department is unable to “patrol” the practitioners in the entire state to determine if reportable diseases are diagnosed, so the success or failure of such a program depends entirely upon the practitioners in the field.

It was the intention of the Department to release each month to all of the practitioners in the State, a compilation of disease data by county, feeling as though it
would be to the advantage of these veterinarians to know what diseases existed in the State as a whole, and in their adjacent counties in particular. This was not done, however, as the early reports indicated that more harm than good would come of such a policy, at least for some time. Many cases of disease have been reported to the Department by outside sources, with no information from the veterinarian in attendance, therefore, they are not contained in the official statistics. In other cases, diseases were reported by the practitioner that proved to be mis-diagnoses. The reporting back of such incorrect data creates either a false sense of security or undue alarm.

It should be pointed out at this time, that no attempt has been made to compile statistics on mortality, as it was appreciated that the morbidity statistics, in their initial stages, was a "sounding board," and it was not desired to make the system too complex in the eyes of the practicing veterinarians.

It has not been a simple task to obtain the full cooperation of the veterinary profession in the reporting of animal diseases. Meetings have been held with local organizations of the profession, to explain the need, objectives and functions of such a program and the important role that the practitioner has in its success. Such meetings have been dominated by complacency and a cry of "socialized veterinary medicine." Attempts have been made to analyze the philosophy of the veterinary practitioners in this regard, by other segments of the profession, and the only conclusion that has been offered is that they are so involved with their own circumscribed activities, that they have no time or interest for the general welfare of the group. It has been my personal feeling that the practitioner, because of lack of understanding, is afraid of a Health Department, and is fearful that reporting of morbidity statistics will subject them to diagnostic scrutiny.

Veterinary medicine has progressed to such an extent that more care should be expected in the diagnosis of disease. Laboratory techniques and specialized fields of practice have been perfected so that the "hit and miss" diagnosis is no longer justified. If the profession is to take its place along with the other medical sciences, it must be capable of assuming comparable responsibilities.

It is my belief that every practitioner of veterinary medicine is a component part of the health program in his community, and as such, should participate in his local and state health administration.

There are many basic organizational measures necessary for the success of a vital reporting system. There must be a standardized nomenclature and standards for causes of death. It is not uncommon to see, reported under species, terms such as "pigs" instead of porcine, or "cows" instead of bovine. This sounds trivial, but creates confusion in the tabulation of statistical material. "Sleeping sickness" is often reported for equine encephalomyilitis and "black tongue" for leptospirosis. It is understandable why the personnel coding the reports are unable to properly classify them.

Without vital statistics, there can be no epidemiology, and without epidemiology, there can be no successful disease control programs. We must realize that mortality statistics give us an important gross index of the success or failure of a Public Health program, and that morbidity statistics are our most delicate measure of the control of communicable diseases. If a satisfactory system has been initiated for the prompt
reporting of communicable diseases, the course of epidemics may be determined and control measures instituted.

Before the full benefits of animal disease statistics will be realized, it is anticipated that a vast educational program must be undertaken to familiarize the veterinarians with proper methods of reporting, benefits to be gained and probably foremost of all, the proper interpretation of vital records, charts and graphs. The veterinary curricula of the existing colleges is noticeably lacking in such training, and it is sincerely hoped that such courses will be included in the future training schedules. It is believed that much of the present lack of understanding originates from the absence of such courses during the academic years.

For vital statistics to be most useful, it is necessary for some agency of Federal Government to direct the program of the states, in order to promote uniformity, assure the dissemination of information and make proper evaluation of reported data. It is imperative that there be free, prompt interchange of morbidity and mortality information, as diseases that occur in one state influence the thinking and activities of bordering states, and in some cases the nation as a whole. It is both embarrassing and inefficient for a state agency to rely upon verbal information as to the incidence of a disease in a neighboring state. Too often we learn of such diseases several weeks or even months following its occurrence, through traveling personnel of another Health Agency or Commercial Company, in either case too late to institute any appropriate control measures. Disease incidence must be common information, available to all concerned, before we can ever expect to control and eradicate.

Morbidity and mortality statistics must be compiled over a long period of time to serve their most useful purpose. We can determine what to expect in the way of disease incidence in the future by a careful statistical trend analysis of what has happened in the past.

The last three months showed a rapid incline in the reported cases of poliomyelitis in Colorado, and the same trend was followed with equine encephalomyelitis. The Department desired to show that the two diseases had assumed a parallel course by super-imposing the graphical charts of both diseases. The lack of proper reporting of the equine cases made such study impossible. It was of both interest and concern that physicians at the hospitals, and in practice, had to inform the Veterinary Public Health Section of the State Department that case histories indicated that the patients were in contact with infected horses. Subsequent investigation revealed that these facts were correct, and that Veterinarians attending the animals made no reports.

In one county of the State, the three veterinarians were alert with their reports, and with mutual cooperation, vaccination of horses was undertaken along with insect abatement. The early diagnosis and reporting of these cases held the incidence of the disease to an almost insignificant level. Had the same cooperation existed in other areas, it is believed that the morbidity and mortality rates from equine encephalomyelitis in the entire state, in both animals and humans, could have been held to a comparatively low figure.

As the medical profession continues to look to the veterinarian for the solution of common disease problems, it becomes increasingly evident that we must conduct
our programs in accord with modern techniques, and have comparable data available for study and comparison.

We have learned a great deal in our comparatively short experience with animal disease reporting. We believe that great strides have been made, although it is realized that we are in our infancy as compared to our allied professions. We are encouraged and optimistic with the future potential, and aware that mistakes will be made. It is our hope that through these errors sound functional animal disease statistics will be developed, along with a stronger understanding between practitioner and official agencies of Government.

In summary, the experiences of two years of animal morbidity reporting has led to the following recommendations and conclusions:

1. That continued education of the veterinary practitioner, as to the advantages to be gained by prompt, accurate reporting and accuracy in diagnosis, is of utmost importance.
2. The inclusion in the Veterinary College curriculum of courses dealing with vital statistics, their reporting, tabulating and evaluation.
3. Compilation of a handbook on standard nomenclature.
5. Use of a weekly reporting card, instead of the "report when diagnosed" system now in operation. Such weekly cares to be forwarded, even when no reportable diseases are diagnosed. This will make the practitioner aware of his responsibility, and give the official agency a closer check on those neglecting to report.
6. The delegation of an agency of Federal Government to coordinate, standardize, compile and release vital animal records collected by the states—with appropriate interpretations.

The Colorado State Department of Health has been most gratified with the interest shown by this organization, in stimulating the reporting of animal statistics, and enthusiastically awaits the reports of its committees. If our experience with this subject will in any way serve to the advantage of this group, it will be a privilege to cooperate.
REPORT OF THE COMMITTEE ON MORBIDITY AND MORTALITY


It is now well recognized that the availability of adequate morbidity and mortality data are prerequisite and fundamental to the establishment of any successful disease control program. Since 1944, the Committee has been actively engaged in an effort to assist in the development and establishment of agencies for the collection, compilation and distribution of morbidity and mortality data on the diseases of livestock. That there exists a definite need for such agencies is now established. In this committee’s 1945 report, the results of an initial poll of Livestock Sanitary Officials and university and experiment station laboratories were reported, confirming the findings of others that reliable morbidity and mortality statistics of domestic animals, showing specific cause, were not available from any source. In the 1946 report, recommendations were made for assembling and reporting vital statistics of animals and for stimulating interest in such a program. In 1947, the results of a poll of those who will be actively engaged in collecting field information, making diagnoses, assembling data, and, finally, using this data for the control of disease, were presented. The consensus was that a “Manual on Nomenclature” and “Standard Methods of Diagnosis” should be prepared and distributed to permit uniformity in reporting, and that frequent (monthly) releases, in some detail, eventually be made available.

A meeting was held in the office of Dr. B. T. Simms, Chief of the U.S.B.A.I., attended by Dr. H. W. Schoening, Chief of the Pathological Division, a representative of the Committee on Nomenclature of the A.V.M.A. and two representatives of this Committee, where it was shown that neither funds nor personnel were available to permit the participation of the U.S.B.A.I. in the preparation of such manuals. The 1948 Committee Report outlined the progress of the publicizing of the program by petitioning the active participation of governmental, agricultural, educational and industrial organizations. During the past year, this activity has been further extended. It has come to our attention that the Bureau of Animal Industry has now made a special request in their budget for 1951 for the establishment of a Section on Vital Statistics in the Pathological Division of the U.S.B.A.I. This budget is now being reviewed by the Secretary of Agriculture. A letter of appeal for support of this request has been sent to:

- 13 members Committee on Agriculture U. S. Senate;
- 30 members of the Committee on Agriculture U. S. House of Representatives;
- 53 experiment station directors;
- 17 deans of colleges of veterinary medicine;
- 7 meat packing organizations;
45 manufacturers of biological and pharmaceutical products;
66 breed and livestock associations;
  3 Farm Bureau representatives;
  6 other farm organizations;
12 editors of farm journals;
48 state veterinarians
23 deans of colleges of agriculture;
60 presidents of land grant colleges, and
80 miscellaneous individuals and organizations.
The response has been gratifying. Many individuals and organizations have contacteed their Senators and Congressmen, the Secretary of Agriculture, and members of the Committee on Budget.

The following outline of purpose was sent to the executive office of the National Federation of Farm Bureaus, at their request:

"Goal: To have a Federal Agency regularly assemble and distribute published data on morbidity and mortality of animals.

Purpose: To have factual data available concerning losses due to either sickness or death, whether infectious, parasitic, or nutritional disease, injury or other causes.

Present Practice: An animal census, including deaths of some animal species, is available through the U.S.B.A.E. Morbidity (sickness) losses and causes are not available from any source. The U.S.B.A.I. issues limited surveys on specific diseases: anthrax, brucellosis, rabies, tuberculosis. The validity of the reports is dependent on the releases issued by state Livestock Sanitary officials who, in turn, are dependent on the industry and capability of the local practicing veterinarian.

What is Needed: 1. Specific diseases or conditions of whatever nature must be identified by the same name throughout the country and the world, for purposes of statistical consistency. A Committee on Nomenclature of the A.V.M.A. has prepared a manual outline to be published which follows "International Statistical Classification of Diseases, Injuries, & Causes of Death," which was prepared by the World Health Organization, for man.

2. The clinician must have a guide to assist him in arriving at an accurate diagnosis, through the aid of a manual which is authoritative, up-to-date, easily followed, which will give him epidemiological data leading to effectual control. A manual on the "Diagnosis & Epidemiology of Infectious and Transmissible Diseases of Animals", to be made available to all individuals and agencies needing it, is now in preparation.

3. Clinical diagnosis must have occasional laboratory confirmation. There are many laboratories in veterinary colleges, experiment stations, bacteriology departments in universities, medical schools, the Army, and Public Health Service and Livestock Disease Control Agencies of the states which are equipped to aid a diagnostic program. Newly recognized diseases with great economic importance are making their appearance with increasing frequency, but we do not know the incidence, the age groups involved, or the geographical distribution, all of which are so important to better epidemiological understanding leading to prevention and control.

Obstacles: Many farmers and livestockmen do not want their neighbors or others to know that they are experiencing infectious disease losses, and therefore avoid
giving statistics to a census taker. The veterinarian is overworked and neglects to report disease findings or fails to have field diagnoses confirmed. Many laboratories have heavy schedules which preclude their participation in a routine diagnostic service. These individuals and agencies are the primary source of morbidity and mortality data. Their full cooperation and participation are essential.

**Our Position:** The Department of Agriculture, through the Secretary's office, recognizes the need for adequate morbidity and mortality data and will institute a program. The urgency of the need, extent, and form of the program must come from those outside the Department. Over four hundred individuals and organizations have been made acquainted with the problem and have independently informed their senators, congressmen and the Secretary of Agriculture of their position.

Your support and full participation are needed.”

It is the consensus of the committee that it should indicate to the Department of Agriculture:

1. What we believe is needed in the way of morbidity and mortality data;
2. Why such data are needed;
3. How much detail should be incorporated;
4. Frequency of distribution and to whom data should be made available;
5. How the data will be used.

It is felt that unless we are directly asked to participate we should not be concerned with:

1. How data are to be collected;
2. Through what cooperating agencies;
3. How the proposed Section on Vital Statistics should operate;
4. Which Bureau should gather the statistical data;
5. Which Bureau should statistically treat and distribute the reports.

This is the business and problem of the Department of Agriculture. We have shown the need, and have made the request. The immediate objectives of this committee are to:

1. Secure the approval of the special request in the 1951 budget of the U.S.B.A.I for the establishment of a Section on Vital Statistics.
2. Expedite the publication and distribution of:
   a. A Manual on Nomenclature, and
   b. A Manual on the Diagnosis and Epidemiology of Economic and Transmissible Diseases of Animals.
3. Prepare the Practicing Veterinarian and the Veterinary Student, through all available means and agencies, to freely give honest and complete reports to the chief livestock sanitary officials on morbidity and mortality, within his state. To this end, this committee recommends that:—

   Colleges of Veterinary Medicine consider the incorporation of Vital Statistics in the curriculum to acquaint the veterinary student with the part he will play in being the initial source of Morbidity and Mortality data; to imbue him with his obligation; to teach him to properly interpret and evaluate statistical data which will be made available to him as a result of his effort.

Mr. Chairman, I wish to present the report of this committee to the Executive Committee for their consideration.
RHEUMATOID DISEASE IN SWINE*

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The conditions described here and designated as rheumatoid disease include joint and skin manifestations as well as heart lesions and some other visceral manifestations commonly observed in swine. These disease manifestations in swine appear to be sufficiently similar to rheumatic and rheumatoid conditions in the human as to be of considerable interest from the comparative standpoint. Moreover, it is possible that any progress made toward an understanding of the disease processes in one species may aid in the understanding of similar conditions in the other species.

The importance of what is here called rheumatoid disease is generally recognized. Many hog growers find it difficult at times to grow hogs profitably because the animals develop rheumatoid conditions. The damage done in affected herds is extremely variable. The occurrence or recurrence of the disease is quite unpredictable.

In some affected herds less than one per cent of the animals show clinical evidence of disease. In an occasional herd more than ten per cent may be seriously affected. In one herd which has been under close observation for many years, one fatal case occurred five years ago. Since that time 600 to 800 hogs have been marketed per year from that herd without appreciable loss from rheumatoid disease. In another herd of 400 animals, 40 became so seriously affected as to be considered worthless. Many other animals were definitely damaged. In still another herd rheumatoid disease occurred on an important scale annually for several years, but disappeared last year for some unexplained reason. The death loss is usually low, but the stunting and unthriftiness are important. Acute cases frequently make spectacular spontaneous recoveries. In some herds rheumatoid disease recurs annually during several years, while in other herds it largely disappears after one year. As has already been said, in herds where it has been a perennial problem, it may disappear without a satisfactory explanation as to why it does. There is a belief that it is more likely to occur in hogs born in the late winter or spring than in animals born in the summer or fall.

The clinical manifestations of rheumatoid disease are quite variable. In some acute cases the body temperature may be as high as 108° F. Some of these acute cases show surprisingly few other symptoms; and, they sometimes make spectacular spontaneous recoveries. Frequently there is more or less evidence of soreness or stiffness, suggesting arthralgia or myalgia. A severe, shifting lameness is sometimes seen. In the early part of the disease affected animals may be unable to walk because of painful joints or muscles.

The skin manifestations are sometimes striking, particularly in white or light-

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colored animals. There may be a circumscribed erythema or the reddening may be
diffuse, especially on the underside of the body. The erythematous areas are often
indurated and may become necrotic and slough later. Occasionally the reddening
of the skin assumes a rather bizarre pattern similar to the erythema annulare
rheumaticum of Lehndorff-Leiner sometimes seen in the human. Subcutaneous
nodules sometimes occur.

In the fully developed chronic stage the joint lesions are quite conspicuous. The
joints are enlarged due mainly to fibrotic periartthritis. The enlargement of the
carpal joint is usually symmetrical, often giving that portion of the leg a spindle-
shaped appearance. The tarsal or hock joint often shows more enlargement medially
than it does laterally. The extent of ankylosis largely determines the degree of
impairment of the affected limb. Disability of the limb may also be considerably
influenced by disease changes within the joint. These changes will be described
later.

The visceral lesions of rheumatoid disease are sometimes easily seen. However,
the most important visceral lesions are often difficult or impossible to detect on
gross examination. Perhaps we may say here what is said of rheumatic fever in the
human: "It licks the joints but bites the heart." The heart often shows marked
gross lesions. There may be a pancarditis in which all layers of the heart are in-
volved. The pericarditis is usually fibrinous and/or fibrotic. Frequently there are
extensive, firm adhesions between the visceral and parietal layers of the pericardium.
Lightcolored areas are sometimes recognizable in the heart muscle. In rare instances
massive vegetative formations are found on and around the auriculoventricular
valves, particularly the bicuspid valve. Similar formations may also occur on the
semilunar valves. Enlargement of the heart is likely to occur in cases of valvular
involvement. Microscopic examinations often shows an extensive myocarditis or
pancarditis which may escape detection on gross examination. In cases where there
is vegetative endocarditis it is common to find evidence of embolic infarction in
various organs, particularly the kidneys. More or less pleuritis and peritonitis
occur in some cases.

The joint lesions consist mainly of increased connective tissue in and near the
joint capsule, together with hypertrophy, and often hyperemia, of the synovial
villi. Occasionally exostosis occurs in the enlargement around the joints. Bony
ankylosis has been observed rarely. The hypertrophic and hyperemic synovial villi
may largely fill the joint cavity. These are sometimes inappropriately called verru-
cae. The presence of these hypertrophic, vascular villi probably accounts for
some of the lameness that occurs in rheumatoid disease. The joint fluid is usually
increased in amount and is often cloudy. Fibrinous exudate is also fairly common in
affected joints.

There is an apparent similarity between the disease condition or conditions
described here and what is called swine erysipelas, attributed to infection by the
_Erysipelothrix rhusiopathiae_. The question of the cause or causes of rheumatoid
disease and/or swine erysipelas is in need of critical reexamination. There is rather
general agreement that it is difficult or impossible to cause disease in swine with
cultures of _Erysipelothrix rhusiopathiae_ when administered in ordinary ways. It is
extremely difficult to find recorded in the scientific literature instances in which this
disease has been consistently reproduced in swine by means of cultures. The recorded work of Loeffler, the discoverer of *Erysipelothrix rhusiopathiae* does not convincingly show the microorganism to have ability to cause disease in swine. On the other hand numerous investigators have tried unsuccessfully to cause disease in swine with cultures of the swine erysipelas organism. Many of these unsuccessful attempts are not recorded in the literature. The writer has failed to cause significant disease in swine with cultures of the swine erysipelas organism. These trials have extended through several years; and have been made with strains of the organism that were pathogenic to mice and pigeons.

Since so much difficulty has been encountered in causing disease in swine with cultures of *Erysipelothrix rhusiopathiae*, one is justified in entertaining some doubt as to the correctness of what we have been taught about swine erysipelas. The history of diseases records many errors in ascribing etiological roles to bacteria. For years human influenza was mistakenly thought to be caused by the so-called influenza bacillus. Psittacosis or parrot fever was erroneously believed to be due to a paratyphoid or Salmonella organism. Progress toward a proper understanding of dog distemper was long retarded because it was generally believed that a Pasteurella organism was the cause. Perhaps the most important example of error in ascribing the cause of a disease to a bacterium is the familiar one of hog cholera. It may be recalled that more than 20 years were required to recover from the mistake of ascribing hog cholera to infection by a bacterium now known as Salmonella choleraesuis. It may also be recalled that, in some instances, elaborate and expensive programs were developed for the control of diseases, the cause of which had not been correctly determined. It may be even more pertinent to note that the etiological role of streptococci in rheumatism in the human is now seriously questioned or entirely disbelieved by some of the ablest investigators.

If what is being called swine erysipelas is considered as rheumatoid in nature we may soon make important progress toward a scientific understanding of the condition or conditions. Research workers have already reported finding filterable agents associated with at least some of the rheumatoid manifestations commonly attributed to infection by *Erysipelothrix rhusiopathiae*. McNutt and coworkers (1) found a filterable agent in pigs that were suffering from arthritis. Köbe (2) isolated a filterable virus from pigs affected by swine erysipelas.

"In conclusion it may be said that a brief description has been given of rheumatoid conditions in swine. Moreover it has been pointed out that there is need for a critical reexamination of the question of what causes rheumatoid disease and/or swine erysipelas in hogs. The belief that *Erysipelothrix rhusiopathiae* is the cause is not too well supported by the available evidence.

REFERENCES


REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASE OF SWINE

J. D. Ray, Omaha, Nebraska, Chairman; R. Fenstermacher, St. Paul, Minnesota; R. M. Gow, Denver, Colorado; L. M. Hutchings, Lafayette, Indiana; R. F. Smith, Indianapolis, Indiana

The Committee on Transmissible Diseases of Swine submits the following as compiled from reports received from state livestock sanitary officials, veterinarians, diagnostic laboratories and U. S. Bureau of Animal Industry.

The prevalence of hog cholera decreased in the U. S. A., in practically all states over the past 5 year period. However, during 1949 an increase has been noted in several states including some in the Middle West. Cholera continues to be the greatest potential menace to the hog-raising industry of this country. In the principal hog-raising areas 50 to 75 per cent of pigs raised are routinely vaccinated. In other states vaccination is much less extensively or consistently practiced. It is estimated that 40 to 45 per cent of the total pigs raised in the United States are routinely vaccinated and that the simultaneous inoculation method is employed in 95 to 96 per cent of those treated. (Estimates based on volumes of serum, virus and vaccines produced, and numbers of pigs saved as reported by U. S. Department of Agriculture, using as average doses 35 cc. serum and 2½ cc. virus)

Considerable loss has been experienced in some states during the past few months. An excerpt from a letter from Dr. R. L. West of the Livestock Sanitary Board of Minnesota, referring to this condition is offered for information.

"Closely related to the increase in cholera has been a corresponding increase in reports of post-vaccination difficulties. In some areas, post-vaccination trouble became so prevalent that the veterinarians involved believed there was some other factor responsible other than those ordinarily causing so-called ‘serum breaks’—possibly an unknown contaminant in the serum and virus, or possibly an unrecognized disease existing in the swine in the territory which became virulent following the administration of hog cholera virus. A careful and rather extensive investigation by the Veterinary Division of the University of Minnesota and this Department failed to substantiate these opinions and would indicate that the trouble was caused in most cases, by the administration of hog cholera virus to animals which were not in proper condition."

Apparently the losses have been restricted largely to the area west of the Mississippi River.

Swine erysipelas is becoming more widely distributed and recently has been reported the most destructive swine disease in some areas. As of August 23, 1949, Erysipelothrix rhusiopathiae vaccine, produced under limited license, may be marketed in the states of Colorado, Florida, Georgia, Idaho, Illinois, Iowa, Kentucky, Minnesota, Missouri, Nebraska, Nevada, New York, North Dakota, Ohio, South Dakota, Tennessee, Utah, Virginia and Washington, (19 states).
Gastro-enteritis caused the death of many baby pigs in some areas during the spring farrowing season. A few cases have been reported this fall.

Infectious enteritis due to Salmonella infections has not been so prevalent the past year.

Respiratory diseases of swine have been prevalent in some territories during the year. Pasturella infection has been encountered frequently. The incidence of influenza has increased. A number of outbreaks of this disease with extensive lung involvement has resulted in a higher than usual death rate. Haemophilus organisms have predominated in lung cultures from such cases.

*Brucella bronchisepticus* infection in pigs has been encountered a number of times during the year. It seems to be increasing in prevalence and has reoccurred on the same farm at subsequent farrowing seasons. Extensive losses have occurred in pigs 3 to 8 weeks of age.

Rhinitis of the so-called atrophic type appears to be spreading. Two reports from Midwestern States made special mention of this malady. The committee suggests that you give this disease due consideration.

Arthritis in pigs from one to four weeks old, associated with streptococcic infection of joints and frequently the navel scar, is increasing in prevalence and constitutes a hazard to the pig crop on infected farms. Infected sows have been incriminated as one important source of the disease.

The discussion of brucellosis has been left to the Brucellosis Committee. However, we want to emphasize the importance of this disease and its control in swine.

The committee feels that research on transmissible diseases of swine has lagged and recommends that the Association go on record favoring increased research in this field.
CURRENT STATUS OF HOG CHOLERA VACCINES


Some forty years have elapsed since Drs. Dorset, Niles and McBryde made public their reports on the causation of hog cholera by a filterable virus and the development of a protective antiserum, steps that paved the way to the simultaneous method of vaccination with antiserum and virus.

During the intervening decades, utilization of billions of cubic centimeters of anti-hog cholera serum and phenolized virus have played a part in development of our great, national swine industry. The serum-virus method, involving as it does the use of a fully virulent virus, is accompanied by both obvious and serious hazards. The quite delicate balance between serum and the inherent resistance of pigs on one hand, and the virulence of the injected virus on the other hand, may be thrown out of balance by a variety of influences. As is well known, these influences include concurrent or latent infections, endoparasites, feeding errors and kindred factors which lower the health level of the treated drove. Thus, any treated pigs developing an over-reaction to injected virus within six to fourteen days, almost invariably die of hog cholera. This, in turn, can only mean that another cholera-infected premise is established.

Here in the United States, the commercial marketing of virulent hog cholera virus has become “big business.” This past year, 91,094,825 cc. of hog cholera virus were distributed and used—much of it by over-the-counter sale to users other than properly qualified veterinarians—and, in many states, with little supervision by livestock sanitary authorities.

In the United States, our direct or indirect losses from hog cholera, including vaccination costs, amount to some 20 or 30 millions of dollars per year. In contrast, the Dominion of Canada, with its large swine industry, spends virtually nothing for the control of this disease. The annual report of Dr. T. Childs, Veterinary Director General of Canada, for the year ending March, 1948, states, “It is gratifying to report that no cases of hog cholera have occurred in Canada for the fiscal year 1947-48. This disease is controlled by the slaughter of all hogs on infected premises, the cleansing and disinfection of the premises and the serum treatment of all hogs in the vicinity of an outbreak.” It is significant that the importation of commercial hog cholera virus into Canada has always been strictly forbidden and that the disease is accorded the same respect that we accord foot and mouth disease and certain other serious animal contagions. In contrast to the wonderful accomplishments in ridding our nation of glanders, pleuro-pneumonia, tuberculosis, tick fever, and other plagues, our accomplishments in the control and eradication of hog cholera within the confines of the United States reflect an obviously poor comparison.

HISTORY OF HOG CHOLERA VACCINES

The hazards incident to the use of virulent hog cholera virus have served as an incentive to veterinary scientists in their search for a safer prophylactic method.

* Jensen-Salsbery Laboratories, Inc., Kansas City, Mo.
CURRENT STATUS OF HOG CHOLERA VACCINES

This incentive was shared by Dr. Marion Dorset (1) who visualized development of a nonviable vaccine which would bring nearer the ultimate goal of hog cholera eradication. His intensive research studies, launched in the early 30's, resulted in his announcement of successful inactivation of hog cholera virus with crystal violet dye in 1935. Following his untimely death, research and field studies were continued by the United States Bureau of Animal Industry, under the direction of Drs. McBryde, Cole and others.

Also in 1933, Dr. W. H. Boynton, (2), a scientist who had for many years pioneered the study of rinderpest in the Phillipines, announced the successful inactivation of tissues containing hog cholera virus with eucalyptol. Dr. Dorset's findings were patented in the name of the people of the United States without royalty, while the Boynton patent was released through the University of California to a commercial laboratory. In the intervening years, experience and added scientific research have resulted in further refinements of commercial hog cholera vaccines. The immunizing value of nonviable vaccines have been amply confirmed by the scientists of other nations, including D'Aspice and Penha of Brasil (3), Doyle and Wright of England (4), Schnorf and Kilchsperger of Switzerland (5), Merieux of France (6), and many others. The statement can now be made that nonviable hog cholera vaccines, within their accepted limitations of usage, have now been accorded the international acceptance of veterinary scientists.

TYPES OF VACCINES

Currently, three types of nonviable hog cholera vaccines are produced under official U.S.B.A.I. license in the United States. These are: (1) A tissue or spleen origin vaccine inactivated with eucalyptol. (2) Blood origin vaccine inactivated with crystal violet dye. (3) Tissue or spleen vaccine inactivated with crystal violet dye. In Brazil, a vaccine prepared from combined virus blood and virus spleens is supplied for intradermal vaccination in a dosage of 0.5 cc. This product was developed by Penha et al. at the University of Sao Paulo (7).

POTENCY

The questions which are possibly uppermost in the minds of livestock sanitarians and veterinarians are:

1. Are swine vaccinated with nonviable hog cholera vaccines adequately protected to withstand natural field exposure to hog cholera virus?
2. What is the duration of the immunity conferred by hog cholera vaccines?

In answer to the first question, all hog cholera vaccines, produced under U.S. B.A.I. license, must successfully pass a mandatory live pig potency test before release for sale. This live pig test, under supervision of veterinary inspectors of the U.S.B.A.I. at licensed plants, is as follows:

Fourteen hog cholera susceptible pigs, weighing 40 to 90 pounds, are required for the potency testing of each serial lot of vaccine. Each of 10 pigs receives 4 cc. of the vaccine. The 4 remaining pigs are held untreated to serve as controls. The vaccinated and control pigs are held in the same pen during the immunizing period. Three weeks following vaccination, each vaccine-treated pig and control is injected with 2 cc. of virulent hog cholera virus and observed for fourteen days. At least 3 of the 4 control pigs shall manifest grave symptoms of acute hog cholera attended
with progressively abnormal temperatures common to the acute type of this disease, subsequent to the third day of the test period and within seven days after the test is inaugurated. At least 8 of the 10 vaccinated pigs shall be well at the conclusion of the fourteen-day test period for a satisfactory test.

In evaluation of this test, one should keep in mind that the minimum lethal dose of hog cholera virus has been estimated, under conditions of controlled experiments, to be as little as one millionth of a cubic centimeter (8). Thus, pigs which receive 4 cc. of vaccine must neutralize as much as two million minimum lethal doses of virulent virus. This is, indeed, an exacting standard for gauging the antigenicity of any biological product.

COMPARISON WITH ANTI-HOG CHOLERA SERUM

The protective value of hog cholera vaccine can be measured by comparing controlled potency tests conducted on vaccine with those conducted on anti-hog cholera serum.

Potency Tests on Hog Cholera Vaccines (Crystal Violet) and Anti-Hog Cholera Serum, 1943–1947

(Tests required to obtain satisfactory completion; and percentage)

<table>
<thead>
<tr>
<th>RESULTS OF POTENCY TEST</th>
<th>HOG CHOLERA VACCINES</th>
<th>HOG CHOLERA SERUM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Serial Lots</td>
<td>Per Cent of Serial Lots</td>
</tr>
<tr>
<td>Satisfactory First Test</td>
<td>72</td>
<td>80.8</td>
</tr>
<tr>
<td>Requiring a Second Test</td>
<td>12</td>
<td>13.5</td>
</tr>
<tr>
<td>Requiring a Third Test</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>Discarded for Lack of Potency</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Total Tests</td>
<td>89</td>
<td>—</td>
</tr>
</tbody>
</table>

In comparing the results of potency testing hog cholera vaccine, crystal violet, and anti-hog cholera serum in our own establishment, we find that tests on both products fall within a definite pattern and compare favorably. These tests were conducted over the same calendar period of four years and during this time we encountered most of the hazards which influence the resistance of pigs to be immunized. To list a few which are common in the experience of most veterinarians, we recall enteritis, influenza, intestinal parasites and pre-vaccination exposure to hog cholera. In summarizing these test results, we find that of 89 serial lots of vaccine tested, 72 or 80.8 per cent passed the first test. Of 458 serial lots of serum tested, 400 or 87.3 per cent were released on first test. Twelve lots or 13.5 per cent of the vaccine required a second test, while 49 lots or 10.7 per cent of the serum required a second test. Four lots of vaccine or 4.5 per cent required a third test, while nine lots of serum or 1.9 per cent required a third test. May we point out that vaccine or serum passing the required second or third test, is of comparable potency to that passing the first test. As mentioned above, the general health and resistance of test pigs are the major factors concerned in the successful testing of hog cholera
vaccines, or hog cholera serum. For the same reason, it should be borne in mind that pigs to be successfully immunized in the field with hog cholera vaccines or by the serum-virus method, should be healthy, thrifty pigs showing gains in weight, and having no history of exposure to hog cholera prior to vaccination.

**Immunity to Withstand Field Exposure**

Our observations on mass field usage have been confined to the output of a single licensed establishment. However, on this basis, it appears that swine given hog cholera vaccine withstand field exposure to the disease on a basis fully comparable to that which is afforded by vaccination with serum and virus.

These observations are further validated by the report of Cole and Henley (9) in 1946, that of 128 head of pigs from 39 herds receiving hog cholera vaccine (crystal violet—blood origin type) 96.1 per cent survived when challenged at market age with 2 cc. of virulent virus.

In comparison, we cite the report of the University of Illinois' project no. 1202 where, of 1,789 pigs vaccinated with serum and virus, 96.48 per cent survived when challenged with virus at market age. Further substantiation of the field dependability of hog cholera vaccine was evidenced by the reports of a survey requested by the U.S.B.A.I. during the early period of marketing Crystal Violet Vaccine. Cooperating veterinarians reported vaccinations of 89,732 head. Of these, only 861 head, or less than 1 per cent were reported as not having adequate protection against subsequent field exposure. United States Bureau of Animal Industry reports reflect a rapid increase in vaccine production during the last eight years. These reports show total production in 1941 to be 422,927 doses; whereas, in 1948, all producers saw fit to prepare 2,028,268 doses of vaccine to meet the demand. During this period, hog cholera vaccines proved to be effective throughout the swine belt and in districts where hog cholera outbreaks were known to exist. This record of 500 per cent increase over the eight-year period speaks for itself in behalf of vaccine immunization.

**Duration of Immunity**

Originally, and in keeping with their usual policy of conservatism, official reports of the U.S.B.A.I. stated that immunity following injection of hog cholera vaccine (crystal violet type) was of approximately eight months duration. A later report by Drs. Cole and Henley (10), in 1946, cited duration of immunity on three experimental lots of pigs. The results are summarized by them with the statement: “The experiments reported in this paper indicate that immunity persists at least one year. Furthermore, in these experiments, a vaccine that protected for thirteen months when first prepared, retained for one year its ability to afford similar protection.”

A year later, in 1947, Doyle and Wright (11) of the British Ministry of Agriculture, Weybridge, concluded that “the vaccine confers protection for at least twelve months. No evidence was found of any increase in the degree of protection between the 21st and 111th day after vaccination.” Pigs used in the British test received either 3, 5 or 10 cc. doses of vaccine and were later challenged by injection of an American strain of virus.
TIME REQUIRED TO AFFORD PROTECTION

The general consensus has been that approximately three weeks elapse between injection of hog cholera vaccine and establishment of full protection. This, of course, has served as one of the factors of limitation in extending the field use of vaccines. It should be kept in mind that almost all of the research reports on this phase of the subject have involved vaccinated pigs challenged with a 1 cc. or 2 cc. dose of virulent virus. This may not be a fair or suitable measuring stick for swine under ordinary farm conditions.

Unpublished data indicate that some degree of protection against field exposure is afforded in as little as seven days after injection of potent hog cholera vaccine. In one test under our direct observation, 10 head of pigs receiving 4 cc. of hog cholera vaccine, tissue origin, successfully withstood a challenge dose of 2 cc. of virulent virus fourteen days later.

INDICATIONS AND CONTRAINDICATIONS

In keeping with the proper recommendations for the use of other biological prophylactic agents, hog cholera vaccines are intended for use on healthy swine only. While it is true that nonviable hog cholera vaccines can be injected into herds of substandard resistance levels without fear of systemic reactions, such practice is inadvisable for the simple reason that swine loaded with parasites or with their resistance levels lowered by chronic infections or other factors, do not respond well to injection of any antigen. This is, of course, also true of injection with antiserum and virus.

The contraindications for use of nonviable hog cholera vaccines include that they should not be given to swine having an unknown history of exposure to hog cholera. This would include pigs presented at community sales, pigs in transit with unknown exposure history and pigs on unsterilized garbage.

A further contraindication and one which must bear emphasis is that hog cholera vaccines should not be used simultaneously with anti-hog cholera serum. This is clearly outlined in circular no. 807, of the U. S. Department of Agriculture, by Drs. Cole and Henley, who conclude that: "The results consistently indicated that serum interfered with the action of vaccine. The interference varied from very slight, when small (10 cc.) doses of serum and large (20 to 30 cc.) doses of vaccine were used to 100 per cent when normally adequate or standard (5 cc.) doses of vaccine were used along with standard (15 to 35 cc.) doses of serum. . . . No justification was therefore found for the combined use of serum and vaccine."

It has long been the undoubtedly proper policy, both of our federal government and the various state livestock sanitary offices, to make haste slowly in officially recognizing the status of animals vaccinated with new types of biological products or those which are tested by new type diagnostic agents. Historic examples are the time lapse between development of the intradermal tuberculin test and its official approval for use on animals shipped in interstate commerce. A like example can be cited for the rapid plate test antigen for brucellosis.

The services and regulatory reports of the United States Bureau of Animal Industry for the past fiscal year show a production of more than two million doses
of hog cholera vaccines. In many states, no modifications or revisions of existent livestock sanitary regulations have been promulgated to define the status of swine receiving hog cholera vaccines.

A recent questionnaire, submitted to the livestock sanitary officials in charge of the various states, brings out the following information:

1. Do your current regulations covering interstate shipment of swine carry any specifications applicable to swine vaccinated with hog cholera vaccines?
   Yes 17  No 24  No regulations  1  No reply 1

2. Are swine carrying a veterinarian's certificate of vaccination with hog cholera vaccine acceptable for exhibition at your State Fair, County Fairs, Swine Shows, etc?
   Yes 30  No 10  No regulations 3

3. In your state, are vaccine-treated swine carrying a veterinarian's certificate of vaccination, acceptable for release from community sales?
   Yes 24  No 16  No regulations 4

4. Do you contemplate that your state will revise or amend existent regulations in so far as such regulations apply to vaccine-treated swine?
   Yes 6  No 30  Indefinite reply 7

5. Do you believe that widespread use of hog cholera virus by purchasers other than properly qualified veterinarians has a bearing on the continued occurrence or propagation of hog cholera outbreaks in your state?
   Yes 26  No 6  Restricted to veterinary use only 10  No reply 1

6. Do your personal observations indicate any increase in field use of hog cholera vaccines in your state?
   Yes 22  No 19  No reply 2

Some fifteen years have elapsed since the development of hog cholera vaccines and some eight years since such products have been licensed for interstate shipment. Further, since official license for production and mass data on the results of field usage are readily accessible, it is our suggestion that all state livestock sanitary officials in their respective states, give consideration and study to the revision of regulations applicable to swine immunized with hog cholera vaccines as an integrated step toward the ultimate eradication of hog cholera.

SUMMARY

Over a period of eight years, the licensed production of hog cholera vaccines in the United States has increased from 422,927 to 2,028,268 doses, annually.

Research and field observations, both here and abroad, establish hog cholera vaccines as valuable prophylactic agents in the control and ultimate eradication of hog cholera. Data is cited that hog cholera vaccines will protect susceptible pigs in a dosage of 4 cc. against as many as two million minimum lethal doses of virulent virus under the official tests required by the U.S.B.A.I.

The indications and contraindications for hog cholera vaccines are cited.
The suggestion is made that existent state and federal livestock sanitary regulations should be amended or revised to grant an official status to swine properly vaccinated with hog cholera vaccines.

Tabulations of a questionnaire directed to all state livestock sanitarians is cited.

We gratefully acknowledge the cooperation of the various livestock sanitary officials in each state for their helpful replies to the questionnaire summarized in this paper.

REFERENCES

(6) Mérieux, Charles: Catalog de Institut Mérieux, April, 1949.
A. H. Quin, Kansas City, Missouri, Chairman; Frank Breed, Lincoln, Nebraska; Burton J. Gray, Fort Dodge, Iowa; C. F. Haynes, Salem, Oregon; J. Schneider, Drexel Hill, Pennsylvania; D. T. Skidmore, Washington, D. C.; Mark Welsh, Ridgewood, New Jersey

While the activities of this Committee have not been officially defined, it is our thought that we can best serve you by presenting a brief review of advancements and developments in the field of biological and pharmaceutical products.

BIOLOGICAL PRODUCTS ACCEPTED OR DELETED

A memorandum from the Serum and Virus Control Division of the B.A.I. cites issuance of licenses for the following new biological products:

- Distemper Vaccine—Foxes (ferret origin) licensed in January, 1948.
- Distemper Vaccine-Mink (mink origin) licensed in February, 1949.
- Pseudomonas Staphylococcus Bacterin licensed in June, 1949.

No biological products have been dropped from the approved list during the calendar year, and no changes of note relative to official regulations governing production have been issued.

VIRUS VACCINE

Continued progress is evidenced in the development of new vaccines and further refinements of existent vaccines aimed at control of the filterable virus diseases.

The new foot and mouth disease vaccine laboratory at Palo Alto, near Mexico City, is geared to produce from 100,000 to 200,000 doses of vaccine daily and in excess of 13,000,000 head of livestock have been vaccinated.

Recent research reports indicate that it may be possible to culture foot and mouth disease virus on the rumen mucosa of slaughtered cattle. If this method works out, it will mean greater production volume and less cost.

In the field of hog cholera prophylaxis, nonviable vaccine made from swine spleens inactivated with crystal violet dye, has proved entirely satisfactory under field conditions. Scientific interest has also centered on the reports of Penha, D'Aspice et al. in Brazil where thousands of swine have been successfully vaccinated with an intradermal dose of a crystal violet-inactivated vaccine of mixed blood and tissue origin. Preliminary reports have been published on attenuation of hog cholera virus by serial passage through rabbits. Subsequently, swine receiving the lapinized vaccine were challenged with virus and found to be resistant. No extensive field tests have been reported.

During this past year, both formalin-killed and live culture Newcastle disease vaccines of chick embryo origin have had wide field usage. In the diversified field of
poultry husbandary both types of products appear to have a place. The formalin-killed vaccine appears preferable for vaccination of broilers, day old chicks and infected farm flocks. The living vaccine appears indicated for hatchery supply flocks, pullet flocks and for chicks over 3 weeks old.

The immunization of animals against rabies is commanding increased attention. Investigators have successfully propogated strains of rabies virus in chick embryos which appear capable of stimulating active immunity and extended field tests are now underway.

**ENTERO-TOXEMIA BACTERIN**

Entero-toxemia bacterin for sheep has had nationwide field use in the past year. While this product is called a bacterin, we should keep in mind that it is, in reality, an anatoxin or toxoid against *Clostridium perfringens*, Type D. *Clostridium perfringens*, Type D toxoid was first reported by Dr. O. H. Muth of Oregon in 1944. More recently, Baldwin *et al.* of Omaha reported extensive use of this toxoid in control of overeating in feeder lamps with altogether satisfactory results. Entero-toxemia bacterin has been granted limited license by the U.S.B.A.I. License has also been granted for *Clostridium perfringens*, Type D antitoxin—a product used as an emergency measure in overeating outbreaks and in pulpy kidney disease of lambs.

**BACTERIAL VACCINES**

Over the past two years, desiccated or lyophilized *Brucella abortus* vaccine and *E. Rhusiopathiae* vaccine have been marketed. These desiccated vaccines do not have to be held under refrigeration and they carry a one year expiration date. Such vaccines are re-suspended with diluent before use. Even though the label legend states "Use Immediately" or "Inject Without Delay After Restoration" some users seem to believe that the resuspended vaccines can be held under refrigeration and used hours, days or even weeks later. Where desiccated vaccines are mishandled in this day, the recipient animals may receive dead organisms and fail to be protected.

On this point the U. S. Bureau of Animal Industry has taken the following stand: "In respect to the Bureau's interpretation of the phrases, "To be used immediately," "Inject without delay after restoration," "Use without delay after restoration," as shown on labels of *Brucella abortus* vaccine (desiccated) and *E. rhusiopathiae* vaccine (desiccated) these phrases mean *use without delay* as stated. We interpret these to mean that the vaccines are to be used on the spot or the farm when restored and not to be used the next day or at some later date. Anyone making the interpretation that these vaccines may be used 90 or 40 days respectively after restoration is distorting the intended meaning."

The importance of complying with these instructions should be emphatically impressed on all users. Neither of these products should be placed in ill repute by improper handling, that is, by resuspending the vaccine *hours* ahead of administration.

**BRUCELLA M VACCINE**

Results following wide field tests of the new vaccine prepared by Huddleson of Michigan from mucoid phase cultures of *Brucella suis* are promising. Herd experi-
ments have been extended under supervision of the B.A.I. and state livestock sanitary authorities to Illinois, Ohio, Virginia, West Virginia, Maryland, Pennsylvania and California. Although the Michigan results are encouraging, it will probably take several more years to determine the true value of this type of vaccine under all types of field conditions.

**BRUCELLA RING TEST ANTIGEN**

At our association’s meeting in Denver last year, Drs. Roepke, Clausen and Walsh presented a paper on the so-called milk ring test for brucellosis. This test of composite milk samples with a special antigen is used to detect brucella-infected dairy herds. Positive reactions are characterized by a color change at the cream line.

Recent correspondence with Roepke and others brings information which can be summarized as follows:

1. Approximately one-third of the infected herds tested on pooled cream or milk ring tests are negative. Of these failures, approximately two-thirds are due to non-producing reactors—largely heifers and dry cows—as the only reactors in the herd.

2. That of the herds positive to the ring test, about 60 per cent show one or more animals positive to the blood test; about 10 per cent with “suspects” only, and about 30 per cent negative to the blood tests.

3. This test is new and should be considered as experimental until appreciably more data are tabulated on its accuracy, value and limitations.

4. Unless future work provides means for greatly increasing the accuracy of the ring test, it cannot be considered a reliable diagnostic test—when used alone—either on a pooled sample basis or on individual animals.

5. That in view of the foregoing, and in anticipation of abuses which would follow promiscuous sale, our Committee suggests that no licenses for production and/or sale of Brucella Ring Test Antigen shall be issued by the U.S.B.A.I.

**THE SULFONAMIDES**

Within recent years, the sulfonamides have become very widely used in the treatment of many livestock and poultry diseases.

These compounds generally are divided into two groups: The first include those that are well absorbed from the gastrointestinal tract and usually are used in the management of systemic infections (sulfanilamide, sulfathiazole, sulfapyridine, sulfadiazone, sulfamerazine, sulfamethazine and sulfaquinoxaline). The four latter compounds also are used in the control of coccidiosis.

The sodium salts of these compounds are readily soluble in water and are used frequently for intravenous and in some instances for intraperitoneal administration to sick animals. This method of treatment provides prompt and effective therapy for many bacterial infections in animals. These sodium salts also are administered in drinking water for the control of certain bacterial and protozoan infections in poultry. Solutions of these compounds with penicillin are used by intramammary infusion for the treatment of bovine mastitis.

Sulfacetamide is one of the newer sulfonamides and has had wide acceptance in
the field of ophthalmology. It would appear well indicated for inclusion in the formula of topical applicants for bovine pink-eye.

Sulfaquinoxaline is the most recently released sulfonamide and is effective in low dosage. It is employed chiefly in the control of coccidiosis and fowl cholera in poultry.

The other group of sulfonamides includes sulfaguanidine, sulfathalidine and sulfasuxidine. They are poorly absorbed from the gastrointestinal tract and are used in the management of bacterial enteric infections. Sulfaguanidine has been employed prophylactically in the control of coccidiosis.

Combinations of several sulfonamide compounds for the treatment of infections are increasing in popularity, since there is less danger of renal toxicity and they are equally or more effective than single compounds.

The Council on Pharmacy and Chemistry of the A.M.A. has deleted sulfanilamide, sulfapyridine, sulfathiazole and sulfaguanidine from New and Nonofficial Remedies, since other compounds and agents are more effective and safer in the control of disease in human subjects.

THE ANTIBIOTICS

A detailed resume of the antibiotics and their role in veterinary medicine was presented last year in Denver and appears in the published proceedings. A second detailed report has been prepared by Dr. Mark Welsh, of our Committee, and is submitted to the secretary for inclusion in the published proceedings of this meeting.

We sincerely suggest that all members study this detailed review of advancements in the antibiotic field for it contains a wealth of practical and strictly up-to-date information.

A preview of the antibiotic report shows that it lists the salient facts about dihydrostreptomycin, aureomycin and such newcomers as neomycin, chloromycetin, bacitracin and polymyxin. Other new antibiotics cited are lupulon—a fungistatic—borrelidin and subtenolin.

It is evident to all that hitherto unattainable results in clinical practice have featured antibiotic therapy and many of the new ones, still in the research laboratory or undergoing clinical trial in human hospitals, hold great promise in the future practice of veterinary medicine.

RECOMMENDATIONS

Your Committee on Biological and Pharmaceutical Products makes the following specific recommendations for approval by the U. S. Livestock Sanitary Association:

1. That all possible influence be exerted to control the promiscuous and unrecorded distribution of live viruses and live bacteria in interstate commerce.

2. That continued effort be made to make mandatory the report of all sales of tuberculin, mallein, brucella antigen, live viruses and live vaccines within the states, to the respective State Livestock Sanitary offices.

ANTIBIOTICS

The antibiotics, having proved of potential value in veterinary medicine, were reviewed in the last annual report of this Association. This is a continuation of your
Committee's effort to, in part at least, keep up to date with the major findings of the research workers in this rapidly developing field. There seems little reason to repeat the definition of an antibiotic or the characteristics of one that may be useful in medicine. These remain the same. Neither does it appear desirable to again review the sources from which antibiotics so far studied, originated, or recount the infinite number of sources as yet uninvestigated. We would, however, strongly urge everyone interested in disease work to closely follow the research and development work on antibiotics. They are new tools and to be fully effective they must be properly used.

In his studies of some 36 years ago, Paul Ehrlich developed the fundamentals of chemotherapy. The first step was to isolate or make a compound that would kill a given parasite in vitro at a low concentration and determine its mode of action, then to select such an agent as was nontoxic or render it so by modification of its structure or otherwise. The third step was to determine the fate of the drug in the body, its optimal dose, route, frequency of administration or special methods for bringing the drug in full chemical combination with the parasite. The fourth step was to apply the agent in controlled clinical studies and to evaluate it by accepted statistical methods. These are as fundamental and simple as the Ten Commandments. When studying antibiotics, they are about as difficult to keep also.

**ACTION AND RESISTANCE**

It is becoming increasingly evident that antibacterial agents of proved usefulness, exert specific interference with the metabolism of the parasite without any similar action on the host tissues. Apparently the bacterial metabolism of a simple bacterial cell differs in action from that of the more complex cell structure of the host. Studies indicate however, that bacterial cells have alternate metabolic mechanisms and when an agent is used that impedes one mechanism, another may be used and a strain resistant to the action of the antibiotic or agent develops. This development of resistance has often been observed with streptomycin, occasionally with penicillin and so far has not been reported with aureomycin. Resistance is unlikely to occur if multiplication of organisms can be stopped at once. Prompt treatment with adequate dosage offers the best hope of control. Combinations of antibiotics or the use of antibiotics, together with sulfonamides offers another possibility. In veterinary work there are few proved cases of bacterial resistance to either antibiotics or sulfonamides, but there is some evidence that cows frequently treated for mastitis with low dosage of penicillin develop resistant types of streptococci. In the human field, resistance of organisms to sulfonamides or antibiotics has been of more academic interest than a proved therapeutic hazard, and organisms resistant to one agent may be high susceptible to another. Considering the frequency with which the udder is treated and retreated for mastitis, it is probable that if resistant strains are to plague us in veterinary medicine, this is the most likely site.

**ADEQUATE DOSAGE**

It is generally accepted that in the effective use of sulfonamides one must maintain proper blood levels of the drug. Marshall and other workers question the
importance of drug levels of antibiotics as a guide in therapy. In several well controlled experiments, the blood level of penicillin was undetectable at the time test animals were injected with specific infections. The controls died and the penicillin treated animals survived. Penicillin levels in tissues and lymph persist for some time after the plasma levels have disappeared. It has been found also that many organisms exposed to penicillin but not killed are retarded in growth for many hours afterward. While it is true that low level dosage with antibiotics may effect the recovery of an infected animal with a specific infection, it is a questionable economy in veterinary medicine. Laboratory facilities for an exact diagnosis are usually lacking, and certainty that only one type of pathogen is involved is doubtful. Prompt treatment with fully adequate dosage is an antibiotic axiom for effective results.

FOUR TYPES OF PENICILLIN

There is but little to add to the penicillin report given last year. It continues to be a most remarkable drug and especially so, considering it was the first antibiotic and has been used in millions of treatments. It is virtually nontoxic and the lethal dose has never been determined, although tremendous single and repeated doses have been given. In about 5% of humans treated there develops a mild to acute urticaria, dermatitis or drug fever. These appear most frequently with oil and wax mixtures which are also prone to cause annoying local tissue reactions.

Of the four types of penicillin, F, X, K and G, the primary type in commercial manufacture is G. It is usually prepared as a crystalline sodium salt although other forms are available. The Romansky method of delaying absorption of penicillin by incorporating it in oil and beeswax seems to be decreasing in popularity. Chemically combining penicillin with procaine, treating penicillin with pectin or with aluminum monostearate are all methods of delaying absorption. Using these various forms of penicillin, an effective therapeutic level following a single injection can be maintained from 48 to 96 hours. Carefully controlled clinical tests using these various forms of penicillin are unfortunately rare in veterinary literature. Verbal and other reports from veterinary practitioners indicate penicillin in these and other forms give satisfactory results in the treatment of a number of infections and particularly the gram positive pathogens. New antibiotics claim the interest of the investigators while the recently developed forms of penicillin lag in being fully evaluated in animal work.

NEW ANTIBIOTICS

Four antibiotics, penicillin, tyrothrycin, bactiracin and streptomycin were reported as being commercially available last year and these were discussed in some detail at that time. There have been no major changes or additional findings in these with the possible exception of one. Streptomycin, in its earlier forms, sometimes caused injury to the auditory nerve following prolonged treatment. Refinements made in this antibiotic are reported to have largely eliminated this type of injury. No attempt here will be made to fully report on the numerous antibiotics under study and in various stages of development. There are a few, however, which seem to have unusual promise and require special mention. Among these are neo-
mycin developed by Waksman. This new antibiotic is reported as being more effective than streptomycin in the treatment of tuberculosis, and bacterial resistant forms are less likely to develop.

Borrelidin is reported to be highly effective in certain spirochete infections and lupulon is used as a fungistatic agent. Subtenolin is another of the numerous antibiotic agents derived from *B. subtilis* and is reported to be effective against various intestinal pathogens. Polymyxin and aerosporin appear to be the same antibiotic of which there are at least four different forms. They are both derived from *B. polymyza*. This antibiotic has a surprisingly wide range of activity and is one of the few effective agents against * pseudomonas aeruginosa*. Susceptible organisms do not develop resistance to it and it has much greater activity in low concentrations than do several of the currently used antibiotics. Although many competent investigators have used polymyxin with desirable results in severe infections where other treatment failed they still consider it to be too toxic for general use. When and if this toxic factor is corrected, another valuable antibiotic will be added to this growing list of useful drugs.

Chloromycetin and aureomycin have become commercially available within the past year. Both are derived from the streptomyces group of molds, but were developed from different species.

Chloromycetin may be given orally or intravenously without significant evidence of toxicity. Necrosis or other injury may follow other parenteral use. In man it has been reported as being effective in the treatment of rickettsial diseases and typhoid fever. There is little information available on its effect on animal pathogens, but it is probable that it will prove effective in the treatment of certain infections. Full evaluation must await further research and investigation.

**AUREOMYCIN**

Aureomycin is another new antibiotic introduced within the last year and has been used extensively in the treatment of a wide variety of human infections. It may be used orally or intravenously but is not as well tolerated when given by other parenteral routes. It produces no significant anatomical or functional changes in the blood or other tissues even on prolonged administration. Following oral administration the drug appears in the urine in about an hour and continues to be excreted up to 6 to 12 hours afterwards. It appears in the cerebral spinal fluid of dogs within about 6 hours after intravenous injection and appears to get into all body tissues and fluids quite rapidly. Aureomycin has apparently the widest range of activity of any of the antibiotics so far studied. It is effective against many protozoa, fungi and spirochetes. It has a wide range of effectiveness against the gram-positive and gram-negative bacterial forms, has proved particularly effective against the rickettsial infections and is effective against certain viral forms of disease such as virus pneumonia which are, as yet, not fully defined.

**INDICATIONS**

It has been used in the treatment of various animal pathogens with good success. When infused into the udder at the rate of 200 mg. per quarter in a petroleum jelly base it was found to be approximately 95 per cent effective in the treatment of
streptococcal mastitis and about 75 per cent effective in the treatment of the staphylococcal types. There is some evidence that it is effective on the coliform types of mastitis, also. One such treatment maintains an effective milk level for a 48-hour period with no clinical evidence of irritation. In acute cases of mastitis accompanied by swelling aureomycin may be given at the rate of 5 mg. per pound body weight of the animal intravenously, and the drug rapidly appears in the milk in therapeutic amounts.

Aureomycin has proved particularly effective in the treatment of brucellosis in man. To determine its effectiveness on brucellosis in cattle, trials were set up and are still in progress. The criteria for a cure in animals is the elimination of Brucella from the milk and a recession of blood agglutinins to an acceptable point. Trials of this kind involve considerable laboratory work and time, and there are insufficient data at present to evaluate aureomycin for this purpose. Some 20 cases of calf scours and calf pneumonia have been successfully treated by intravenous injections of aureomycin. Similar treatment was effective in some few cases of strangles in valuable horses.

Prepared as a topical ointment at the rate of 30 mg. of aureomycin per gram of base, the drug was tried under a variety of conditions. As in human corneal ulcers, conjunctivitis and other eye infections responded promptly without irritation to the tissues. Various mixed skin infections, some involving fungi, responded well to treatment. Chronic refractory cases of otitis externa or ear canker in dogs were successfully treated and recovered usually within a treatment period of 3 to 10 days. Laboratory data and human clinical work would indicate that aureomycin may be effective on a much wider range of animal pathogens than those so far studied.

CONCLUSION

No claim is made as to the completeness of this review of antibiotics, but the field is so new and active that complete coverage is virtually impossible. It is evident, however, that these new agents are effective against disease for which there was no previous successful treatment, and they reduce the time of recovery of many others for which less active drugs were available. Most farm produce is marketed in the form of meat, milk, or eggs, and animals form the bottleneck through which our grasses, grains, and forages much flow. When properly used, these new antibiotic tools can do much to free the bottleneck of clogging losses caused by dead, sick, and partly efficient animals. A master craftsman must know when and how to use his various tools, and we must learn to use our new tools.
REPORT OF THE COMMITTEE ON RESOLUTIONS

C. P. BISHOP, Harrisburg, Pennsylvania, Chairman; WARREN B. EARL, Reno, Nevada; C. F. HAYNES, Salem, Oregon; D. H. RICKS, Oklahoma City, Oklahoma; R. S. ROBINSON, Pierre, South Dakota; W. H. SHANNON, Boston, Massachusetts; RALPH WEST, St. Paul, Minnesota.

RESOLUTION 1

WHEREAS, brucellosis control and eradication is one of the objectives of this Association and the goal of a National Brucellosis Program, and

WHEREAS, a National Brucellosis Committee composed of representatives covering each phase of the livestock industry, together with public health and other allied agencies and interests, can be a potent and constructive force in this cooperative enterprise, therefore

Be It Resolved: That the United States Livestock Sanitary Association fully recognizes and keenly appreciates the importance and influence of such a committee in dealing with the broader aspects of this gigantic undertaking, and respectfully solicits the cooperation, recommendations and suggestions of this Committee during this formulation of plans and procedures designed for the control and eradication of this malady.

Be It Further Resolved: In view of this contingency, that the newly created National Brucellosis Committee be, and same is hereby urged, to actively participate in the deliberations of this Association on this all important disease.

Be It Also Resolved: That the Secretary be instructed to forward a copy of this resolution, and otherwise make known the attitude of this Association to the proper constituted officers of this Committee.

RESOLUTION 2

WHEREAS, foot-and-mouth disease persists in wide areas throughout the world, and now exists on the North American Continent, posing a constant threat to the livestock industry of the United States, and

WHEREAS, the vesicular diseases of livestock clinically similar to foot-and-mouth disease occur not infrequently in the United States, and

WHEREAS, prompt steps should be taken in each occurrence to establish appropriate control measures within the state, and

WHEREAS, early diagnosis is paramount and requires coordination between the livestock industry, state regulatory officials and the Federal Bureau of Animal Industry, and

WHEREAS, the differential diagnosis of vesicular diseases requires special training and experience and there are at the disposal of the several states specially trained technicians and diagnosticians of the Bureau, now

Be It Resolved: That the livestock industry should be alerted to report suspicious cases to his veterinarian and/or to the regulatory authorities of the states, and that the state authorities should promptly report any occurrence of vesicular diseases to the United States Bureau of Animal Industry with the immediate objective of

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conducting joint diagnostic tests on the ground and the Bureau should, in turn, advise the livestock sanitary authorities of the several states of any situation warranting such action.

**Resolution 3**

*Whereas,* it is recognized the viable *Brucella abortus* vaccine is one of the most important factors in the control of brucellosis in states where vaccination is employed as a part of the brucellosis control program, and

*Whereas,* the dried vaccine now available from several manufacturers has a long dating, is subject to little, if any, injury by those handling the product between the manufacturer and the veterinarian who reconstitutes it at the time of use and the user has assurance there are the proper number of viable cells at the time of use, and

*Whereas,* the reconstitution of the dried vaccine is a simple procedure for any veterinarian and its proper care and use are within his training and experience and both the single and five-dose packages have been successfully used for several months, and

*Whereas,* it is reliably reported the United States Bureau of Animal Industry is rescinding the permits for the manufacture of the five-dose package of dried *Brucella abortus* vaccine which if done would markedly increase the cost to states furnishing this vaccine to veterinarians cooperating with the states on brucellosis control programs, and such veterinarians are deemed competent, and in such work are officers of the state working for and under the direction of the state official, therefore

*Be It Resolved:* That the United States Bureau of Animal Industry be requested to permit the manufacture of the five-dose dried *Brucella abortus* vaccine package and its sale to such states which may wish to use it under the direction of the proper state official for the purposes of safety and economy in the conduct of their brucellosis control programs.

*Be It Further Resolved:* That inasmuch as the brucellosis control and eradication programs are conducted under provisions incorporated in articles of agreement between the United States Bureau of Animal Industry and the several states, and that maximum results can be attained only when both agencies are working in harmony, it is imperative that officials of such agencies make no changes which may directly or indirectly affect the program without first submitting such changes to the proper cooperating authorities and receiving approval before making them effective.

*Be It Also Resolved:* That the Secretary of the Association be instructed to forward a copy of this resolution to the Secretary of the United States Department of Agriculture and the Chief of the United States Bureau of Animal Industry.

**Resolution 4**

*Whereas,* the ABR or Ring test for brucellosis is receiving increased attention and consideration in the diagnosis of brucellosis, and

*Whereas,* the indiscriminate use and unintelligent application of the test may result in misinterpretation and jeopardize the brucellosis eradication program, therefore
Be It Resolved: That the manufacture and distribution of the antigen for conducting said test shall be exclusively confined to the Bureau of Animal Industry, United States Department of Agriculture.

Be It Further Resolved: That the Secretary be instructed to forward a copy of this resolution to the Chief of the United States Bureau of Animal Industry.

RESOLUTION 5

WHEREAS, white muscle disease (Muscular Dystrophy) has been taking an increasing toll of the calf crop in Montana, and

WHEREAS, there is no known cause, prevention or treatment for this disease, therefore

Be It Resolved: That immediate research be encouraged on a regional basis; that the assistance and cooperation of the neighboring states of Washington, Idaho and Oregon be enlisted.

Be It Further Resolved: That a copy of this resolution be sent to the Stockgrowers Associations of Washington, Idaho and Oregon.

RESOLUTION 6

WHEREAS, the United States Livestock Sanitary Association has been the recipient of a communication from the practitioners committee of the American Veterinary Medical Association requesting closer cooperation with regulatory officials in the administration and advancement of the Brucellosis Eradication Program, and

WHEREAS, this aforesaid communication requests that wider employment of the services of the veterinary practitioner be utilized in blood letting, vaccinating, advising owners relative to sanitary control measures designed to bring about the eradication of brucellosis from the livestock of the nation, and

WHEREAS, we of the United States Livestock Sanitary Association deeply appreciate the sincere and earnest offer of assistance from veterinary practitioners in attaining the goal we seek, namely, the eradication of brucellosis, and

WHEREAS, we, as a regulatory group charged by law to eradicate or control infectious communicable diseases of livestock and diseases communicable from animal to man, realize the importance of the aid the veterinary practitioner can render and do, now, as we have always in the past, solicit the assistance of veterinary practitioners in the promotion of the program; the education and guidance of our livestock men in the employment of sanitary measures; the vaccination of stock in accord with adopted programs for the area, and for other services that he can render in the nationwide program of eradication of brucellosis, and

WHEREAS, it apparently is now recognized that there is need for greater and closer liaison between private veterinary practitioners and those responsible by law in the regulatory field, and

WHEREAS, we, of the regulatory field, entertain and experience a keen sense of loss of opportunity for contact with practitioners at the annual meeting of the American Veterinary Medical Association through the discontinuance of the section on sanitary science, therefore

Be It Resolved: That every effort be inaugurated to augment the feeling of mutual
responsibility, respect and closer cooperation between veterinarians as such, regard-
less of their respective chosen fields for the practice of their training as veterinarians,
to the end that the industry we both serve may be benefited in the ultimate.

RESOLUTION 7

WHEREAS, there is need for the control over the movement of animals affected
with brucellosis in interstate commerce, and

WHEREAS, the United States Livestock Sanitary Association has repeatedly,
over the last several years, requested the Secretary of the United States Depart-
ment of Agriculture to obtain whatever legal authority is necessary to the end that
animals reacting to the test for brucellosis may be legally moved over state bound-
aries for immediate slaughter or returned to herds of origin, and

WHEREAS, there is presently in Congress a bill designated as S-2188 introduced
by Senator Thomas of Oklahoma on June 2, 1949,

Be It Resolved: That the United States Livestock Sanitary Association in con-
vention assembled in Columbus, Ohio, October 13, 1949, wishes to go on record as
strongly favoring the passage of this most necessary piece of legislation and request
that copies of this resolution be presented to the members of the Committee on
Agriculture of both the House and Senate, the Secretary of Agriculture of the
United States and the Chief of the Bureau of Animal Industry.

RESOLUTION 8

Be It Resolved: That we urgently recommend that controlled research in vaccina-
tion and treatment of brucellosis be carried out by the United States Department
of Agriculture, Bureau of Animal Industry, either independently or in cooperation
with research agencies in states equipped to carry on such experimentation.
Currently we would suggest experimental and research study with:
(a) the newer antibiotics or other drugs that might have promise.
(b) mucoid vaccine to determine its value in the control and eradication of
brucellosis and its safety for use from the standpoint of human health.
(c) the revaccination of animals and the vaccination of adult animals.
(d) the study of the practicability of avenues of administration of vaccine, other
than the subcutaneous, to determine the most effective method of vaccine
application.
(e) methods of differentiating, thru the application of a practical test, between
reactions resulting from infection with virulent Brucella organisms and those
resulting from vaccination.

RESOLUTION 9

Be It Resolved: That the United States Livestock Sanitary Association request
the Congress of the United States to amend the livestock disease control laws, which
will permit the Secretary of the United States Department of Agriculture to pro-
mulgate rules and regulations requiring manufacturers and distributors of serums,
vaccines, viruses and toxins, to render concurrent reports to the Chief Livestock
Sanitary Official of the state of destination covering all sales and distribution of the products herein mentioned.

- Ovine ecthyma vaccine
- Tuberculin
- Products made from brucella organisms
- Hog cholera virus
- Swine erysipelas vaccine
- Living Newcastle vaccine
- Laryngotracheitis vaccine
- Anthrax spore vaccine

**RESOLUTION 10**

*Be It Resolved:* That we extend our thanks and appreciation to the manager and employees of the Neil House, for the satisfactory accommodations provided, and for the many courtesies extended to our members and visitors.

**RESOLUTION 11**

*Be It Resolved:* That we commend our fellow member, Dr. Harry Geyer, the Columbus Convention Bureau and the Committee who contributed their help and assistance in making local arrangements, necessary for the success of the Fifty-third annual meeting of the Association.

**RESOLUTION 12**

*Be It Resolved:* That the Secretary-Treasurer of this Association be authorized to supply copies of the foregoing resolutions to the appropriate persons, and by letter, direct their attention to these resolutions.

**RESOLUTION 13**

*Be It Resolved:* That the United States Livestock Sanitary Association convey its sincere thanks and appreciation to each speaker on the program, and to each member of the several committees, for their services in the preparation and presentation of the program of the Association.

**RESOLUTION 14**

*Whereas,* it is the practice of associations of comparable significance to the United States Livestock Sanitary Association to honor their elected chief executives with (or by or thru) the presentation of such evidence and appreciation at the time they assume the office of President, therefore

*Be It Resolved:* That the Secretary be and is hereby instructed and authorized to have an appropriate key or similar emblem prepared for this purpose.
HATCHERY DISEASE CONTROL IN THE FUTURE

GEORGE BERRY

Berry Brothers Hatcheries, Quincy, Illinois.

Mr. Chairman and Gentlemen:

A few years ago, the poultry and egg production of the United States was a billion dollar business. Last year, government figures showed the poultry business to be a three billion dollar industry.

A few years ago, poultry diseases were estimated to cost the industry over one hundred million dollars annually. It is probable that poultry diseases are today costing the poultry raisers of the United States more than three hundred million dollars annually. To those in the hatchery business, the disease problems are serious. Our industry is comparatively new and there have been abuses of many kinds which those who expect to stay in the business hope to control better in the future.

Everyone in the poultry and hatchery business has continually lived with and fought all kinds of poultry diseases. I was born and raised on a large poultry farm and hatchery in southwestern Iowa where we raised and handled thirty thousand to fifty thousand purebred chickens yearly, selling breeding stock by mail all over the United States. I can remember that in the winter of 1919-1920, we lost over ten thousand matured chickens with a respiratory disease. My brother and I spent Saturdays and every evening and night after school trying to doctor sick chickens. As high school boys, we concluded the treatment of respiratory diseases in poultry was just a lot of drudgery, and that the best remedy was the axe. Again in the winter of 1924-1925, the first year I operated a hatchery by myself in Freeport, Illinois, we experienced the trials and tribulations of the quarantines and supervision connected with the European Fowl Plague.

The dark shadow of poultry diseases has been a constant threat to the success of conducting a profitable business. The concentrated hatching and growing of thousands and millions of chicks in a small area has complicated hatchery problems. In our Quincy, Illinois plant, we set one and a fourth million eggs every three weeks, and keep over two hundred thousand started chicks up to four weeks of age in brooders, all within a city block of the largest department store and hotel, and next door to a large five-story Masonic Temple. We have other plants that are scattered over ten and twenty acres of land, but diseases seem to spread about as fast one place as another.

HOW DO THESE DISEASES SPREAD OVER THE COUNTRY SO FAST?

Are birds responsible? Is disease carried on feed sacks, especially the second-hand ones? Are eggs and egg cases responsible for the spread of a lot of diseases? Are the mail order hatcheries spreading disease through the many thousands of shipments they make? Are the diseases air borne? Probably all have some part in the spread of poultry diseases.

We hear stories about irresponsible hatcheries and chick dealers shipping diseased chicks. I expect a lot of us have been accused of such things, but it is awfully hard
to believe that any hatcheryman who expects to stay in business would willingly or knowingly ship chicks which show any signs of disease, or were known to be from diseased stock. The bad part about the disease problem in the hatchery business is that a few "in-and-outers" in the hatchery business can wreck the good work that thousands of honest, responsible hatcheries are doing every day.

The hatcheries of this country need the help and the co-operation of the Livestock Sanitary Association and all veterinarians. There has been certain conflicts of ideas in the past between hatcherymen and veterinarians. I can remember that about fifteen years ago, a bill was introduced in the State Legislature of Kansas, specifying that only licensed veterinarians could conduct official pullorum testing in the state and that the charge would be 10¢ per chicken for their work. If this bill had passed at that time, it would have cost the hatcherymen of Kansas over one hundred thousand dollars yearly and would have killed all official testing work for many years. Even though the Kansas State Livestock Sanitary Commissioner had personally opposed the bill, there was considerable resentment, and although the bill did not pass it didn't make for very pleasant relations for many years. In the past 25 years, I have probably had personal contact with at least 25 veterinarians, and the percentage of veterinarians who are interested in even looking at chickens on the farm is very low. I believe the trend of the poultry and hatchery business is very definitely toward a closer co-operation and more pleasant relations.

I would like to discuss a few of the disease problems which affect our industry and how it is felt the hatchery and your Association can work for better disease control in the future.

The first problem concerns pullorum disease. The status of this disease is in a somewhat muddled form today. In many Northeastern States, a large percentage of the breeding flocks are "Pullorum Clean" or "Pullorum Passed." In the middle west where we deal with smaller flocks over a wider area, all hatcheries operating under the National Plan are now "Pullorum Controlled" or better. But the trouble is that not enough hatcheries are even bloodtesting flocks today. You may not realize it, but there are probably over six thousand hatcheries producing at least three hundred million to four hundred million chicks every year who are not officially bloodtesting, and there probably is between one hundred million and two hundred million chicks produced every year that are not from pullorum tested stock. The figures may be even worse than this, and I have made them as optimistic as possible.

A few weeks ago I had occasion to visit a hatchery in Pella, Iowa. This hatcheryman told me that there were six hatcheries in the town, and his was the only one that was following a consistent pullorum testing program. Last year one of our hatcheries contracted about 100 breeding flocks some distance away, who had previously been selling to a large hatchery who had been advertising pullorum tested chicks for twenty years or more. When our man called to cull and test these flocks we found some of the flockowners had never seen blood-testing work done before. We found others who said that the hatchery had only bloodtested the roosters, on the theory, I suppose, that only roosters could transmit the disease to the baby chicks. We had to throw out over half of the flocks and keep mostly leghorns and varieties which ordinarily show a small amount of pullorum.
Practices of this kind must stop. They hurt everyone, and by the co-operation of the good hatcheries and your Association, adequate laws and supervision can eliminate most of the abuses.

A discussion of pullorum disease brings up one of the big problems of the mail order hatchery, which is becoming greater every year. This has to do with state laws, sometimes known as discriminatory laws—barrier laws—and probably by a lot worse names by some people. Today we have laws in a number of states having to do with pullorum disease. The laws are different in each state and changing all the time. For instance, the State of Georgia has made a new ruling that it will not recognize the "Pullorum Clean" rating unless done by the test-tube method. There has been a lot of quarantine laws enacted against chicks passing from one state to another.

There is some question as to whether these barrier laws are actually working for the benefit of the entire baby chick and poultry industry. There is a question as to whether such laws do not antagonize hatcherymen in other states into boycotting the products of those states having special prohibitory laws. Some hatcherymen in other states feel that the barrier law states have them so local hatcherymen can monopolize the chick business in their own states. If this is true, or only partly true, then free enterprise certainly doesn't exist for all hatcheries in the United States.

It is very hard to see or believe that individual state barrier laws regarding pullorum disease are of much benefit to anyone, although I know that many hatcherymen and public officials in the states having barrier laws won't agree with me. I know what we are doing in the case of our own business and I have heard quite a number of other hatcherymen express the same feeling. For many years, we bought quite a few thousand dollars worth of eggs and chicks from specialty breeders in some of the states now having barrier laws. We have now found satisfactory sources of foundation stock in states without barrier laws.

The irony of the whole situation, with regard to barrier laws, is that mail order hatcheries don't worry much about them, nor have they seen where these laws hurt their business. So long as the United States Post Office Department will carry chicks by mail to any state in the Union, these barrier laws are somewhat ineffective and can't mean very much because they are not enforceable.

U. S. Senator Langer of North Dakota recently introduced a bill in the United States Senate which would prohibit the post office department from accepting chicks suffering from pullorum disease. Such a bill could produce much good, and if it had been passed 20 years ago, constructively designed to stamp out pullorum disease throughout the country, I firmly believe pullorum would almost be a thing of the past. It isn't too late for a law of this kind, if properly handled, and such laws on a federal basis should work for the good of all responsible hatcheries who want to produce good chicks.

The National Poultry Improvement Plan has a definite plan toward the elimination of pullorum disease, and conscientious hatcherymen are doing the very best possible job.

What is the future of pullorum disease in the hatchery business? It is our hope that all states and the federal government will work together in passing laws tightening the control of pullorum disease. The quality of the men doing the work
should be higher. In no case should the hatchery owner be licensed to do the work on his own flocks and in every case the work should be checked carefully by a qualified inspector, and not haphazardly as some states are now doing the work. All breeding flocks should be tested at least twice a year and preferably, three or four times a year. But the main thing is that all hatcheries must comply.

A practical law for the future is that no chicks may be produced by any hatchery or individual unless the parent stock has been officially pullorum tested, is clean and all sanitary requirements met for the production of the chicks. Frankly, until such laws are passed, the chick raisers of the United States are not getting a fair deal. A sound breeding, disease and management program using pedigreed male birds and doing conscientious pullorum testing and other disease control work in the flock and hatchery costs a lot of money. The hatcheries doing little or no improvement work in breeding and disease control can cause a lot of trouble because they produce a lot of cheap, poor quality chicks that makes it awfully hard for the conscientious hatcheryman to compete with in price. We must remember that considerably more than half of all the chicks produced in the United States are still bought by poultry raisers who raise less than 500 chickens, and many of these people don’t care too much what they have as to quality. Trying to educate this class of poultry raisers themselves to raise better chickens is almost impossible because they are not raising them for profit to begin with, so they just don’t care.

The other poultry disease problem I would like to discuss concerns the respiratory diseases of poultry which include laryngotracheitis, bronchitis and Newcastle disease as the three main diseases to consider.

An effective vaccine is now available for laryngotracheitis so the main problem with this disease lies with the individual poultry raiser in properly recognizing and protecting his flock.

Bronchitis is very serious, and so far as I know the only recommended treatment is to allow young birds to have a mild outbreak of the disease which immunizes them against further trouble. No doubt the problem of better bronchitis control will be discovered about the time a better control for the common cold in humans is discovered.

The situation about Newcastle in poultry has certainly been a very unhappy one. There has been those who recommend vaccinating, and those who condemn vaccinating. Some states restrict vaccinating. Some states want to quarantine every known cast of Newcastle on farms for two years. Other states recommend cleaning up and learning to live with the disease. There has been a lot of talk, a lot of words written, a lot of poor guessing, and a lot of bad publicity. Vaccinating with live virus helps but certainly is not the final solution of this disease by any means. We used live virus on over 300,000 breeder hens last year. We are vaccinating over 400,000 breeding hens this year. We have used killed virus vaccine on over 600,000 chicks in our own brooders in the last six months, vaccinating at from one day to 16 days of age, with chicks from both immunized hens and non-immunized hens. We think we know something about the disease but we certainly don’t know any final solution for complete control.

We do believe that there has been a lot of impractical and non-thinking talk on the subject of Newcastle disease, even by veterinarians. We have had a few cases
where veterinarians would tell our customers that their chicks had Newcastle disease contracted from the hatchery, after the customer had had the chicks four or five weeks. The veterinarian would advise the chicken raisers to kill all their young stock, sell the old hens, burn down the brooder house and not raise any chickens for two years, the hatcheryman would pay the entire cost. We know of a few poultry raisers in one state who had outbreaks of Newcastle in their breeding flocks and a state veterinarian, without even seeing the flock, quarantined them, over a year ago, and the poultry raiser still thinks his place is under quarantine even though he hasn't had a chicken on the place for the last eight months.

There are other poultry diseases of course which cause millions of dollars of loss every year such as leukosis, coccidiosis, cholera, typhoid, and of course both the internal and external parasites. Consistently sane thinking and control methods have been used for many years.

Bad publicity about poultry diseases has hurt, and is still hurting, the poultry industry. A lot of articles have been written for the farm and poultry press that excite people but solve nothing. A lot of publicity has been given poultry diseases before the scientists and pathologists know much about the disease, its prevention, control and treatment. When colleges and veterinarians of different states can't agree on how to treat different diseases and how to control them, then the hatcheryman is certainly in a bad spot himself. Some of the prevention and control ideas sound pretty fanatical and unsound to the practical poultryman who has to live and fight diseases every day in order to stay in business.

Disease problems can be controlled by sane and practical planning and doing, not by unsound regulations and a lot of theoretical publicity that is hurting the industry. Every hatcheryman can, and must, use better disease control methods in the future. He must be more honest in his disease control work. Strict rules and regulations by government inspection must come. When the Newcastle scare started a few years ago, we were accused, as many hatcherymen were, of producing diseased chicks. To offset trouble we had two local veterinarians inspect every 24 incubators, holding over a million eggs, and every brooder room, and every battery of chicks, containing over 225,000 chicks every day. These men came in every morning and made a thorough inspection for which we paid them their regular fee. These veterinarians came in before our regular employees came to work in the morning, so they could thoroughly check everything. We kept this up daily for three months.

I don't think that every hatchery should have to be inspected that closely, but in the interest of control of transmissible diseases in poultry, I do believe that every hatchery should be thoroughly inspected at least once each week, and probably, twice each week so long as they have eggs in the incubators or chicks in or near their premises. This inspection should be done by a qualified inspector at the expense of the hatchery.

Hatcherymen in general are in favor of better regulatory laws in every state regarding the control and treatment of poultry diseases. You could be assured of the active co-operation of every hatcheryman who is in business to stay and to build for the future. The opposition to stronger laws and regulations which hatcheries and your Association sponsors will come from a few large hatcheries who still have the practice of buying country store eggs and selling a lot of cheap chicks of
unknown ancestry. Opposition will also come from some of the smaller family operated hatcheries who barely make a living by producing cheap chicks in old, wornout incubators, not properly fumigated or helped in any way. Hatcherymen want unity of thinking and action. We want to do a better job of fumigating and disinfecting our premises and giving sound advice to poultry raisers. We want to produce more livable chicks, and we want to control diseases.

Right now we have the problem of disease transmission through insanitary express and mail cars. I well remember some of the shipments of pullorum clean chicks I received from New England states a number of years ago. They had been put in the same express and mail cars with chicks produced by hundreds of hatcheries in the middle west, and the result was that the pullorum clean chicks died like flies. For many years the shipping of chicks by common carrier has been a big headache to mail order hatcheries and breeders, because the railroads don’t seem to care what happens. Perhaps you might think it is awfully funny business for a hatcheryman in the eastern part of the United States to ship thousands of chicks into the middle west, or that a middle western hatchery would ship millions of chicks into Eastern States. Since 1905, when our poultry farm and hatchery organization started to keeping records, we have shipped more chicks into Pennsylvania and New York than any other states. It may be the old principle of the “grass is greener in the other fellow’s yard,” but it’s human nature, and I don’t believe that any laws or any regulations you make as to buying habits and buying controls will change people’s minds. Consider also that at least three-fourths of a billion chicks, seven hundred and fifty million, chicks, are sold to women, and we all know that it’s mighty hard to change a woman’s mind.

So we must approach this disease problem of transportation of chicks throughout the United States in a practical manner. When the railroads put eggs for market, hatching eggs, day-old chicks, four-week-old chicks, old hens for market, pedigreed breeding stock, show stock, pigeons, ducks, geese, turkeys, parrots, dogs, and diseased chickens going to some laboratory, all in the same express and mail cars, it’s little wonder we don’t have more bad trouble than we have. A consistent program of disinfection and fumigation by the railroads in co-operation with the express and mail service is badly needed. Your Association can help in sponsoring regulations which will control this problem.

The hatchery and poultry business is changing very rapidly daily. There is a revolution in the foundation of the poultry business from a breeding, management and disease standpoint. In the Northeastern States we see immense poultry houses holding ten thousand and twenty thousand hens each, with as many as sixty thousand and seventy thousand laying hens on one farm. Crossbreeding, inbreeding and intensified purebreeding for specific characteristics is changing the poultry business from a back lot affair to a highly specialized business. The broiler sections of Delaware, Maryland, Virginia, Georgia, Arkansas and Texas has completely wiped out the farmer as a producer of broiler and fryer sized chickens. Even with concentrated number of chickens running into the millions in small space, the newer disease control methods make it possible to raise a larger percentage of chickens than the average farmer can raise. I know of a number of feed companies and large poultry farms and hatcheries who are today employing veterinarians to handle disease
control on these large poultry farms and in broiler areas. In the next ten years, you will see a lot more of this. More men are being trained for the work right today. Our own hatchery business has one young men who has his doctor's degree as a graduate geneticist who is taking further training work in poultry breeding work, and we have three young men now taking poultry work in college who expect to become veterinarians, and eventually handle the breeding and disease control work on our poultry farms. Our plans today call for increase in size and establishment of four large poultry farms with a total population of between one hundred thousand and one hundred and fifty thousand hens. Other hatchery organizations are planning the same things for the future. Disease control will be better because the work will be in the hands of better trained men and the men in your association will be able to work more closely with such a group of hatchery and poultry organizations than ever before.
AVIAN LYMPHOMATOSIS, ANOTHER EGG-BORNE DISEASE

G. E. Cottral, D.V.M.

Regional Poultry Research Laboratory, Agricultural Research Administration, U. S.
Department of Agriculture, East Lansing, Michigan

Proof that infectious agents can be transmitted from mother to offspring through the egg has been available since 1867. The first clear-cut demonstration of the transmission of an infectious agent from one generation to the next through the egg was brought out in the classical work of Pasteur on pêbrine, a protozoan disease of silkworms, caused by Nosema bombycis. Although Pasteur demonstrated the method of transmission of pêbrine in 1867, he did not formally publish his findings until 1870 (39). The concept of egg transmission did not originate with Pasteur, but he was the first to prove that it did occur.

EGG-BORNE DISEASES IN ARTHROPODS

The second important demonstration of an egg-borne disease was the work of Smith and Kilbourne (48) on the role of the tick, Margaropus annulatus, in the transmission of Texas fever of cattle. In 1893 they demonstrated conclusively that the organism, Babesia bigemina, is transmitted from bovine to bovine only through the agency of offspring of female ticks which have previously fed upon the blood of cattle which at the time of feeding were suffering from, or had recovered from, an attack of Texas Fever (17, 48). However, the final proof of egg transmission in the tick was not established until 1932 when Dennis (17) reported on the life cycle of Babesia bigemina, and demonstrated how the organism gained entrance into the tick eggs.

Rocky Mountain spotted fever, a rickettsial disease of man, was proven to be harbored by the tick vector, Dermacentor andersoni, and it was demonstrated that the disease was egg-borne in the tick (43). Other important diseases of man, domestic animals and plants that were found to be capable of trans-ovarian passage in their respective arthropod vectors are: phlebotomus fever (36), boutonneuse fever (6), scrub typhus (40), Colorado tick fever (23), St. Louis encephalitis (47), western equine encephalomyelitis (49), fowl spirochaetosis (20) and dwarf disease of rice (24). These diseases are listed in table 1. In addition to the examples listed there are many other diseases that are transmitted through the egg in arthropod vectors such as: Russian spring-summer encephalitis, loping-ill of sheep, tularemia, piroplasmosis of cattle and dogs, and spirochaetosis of cattle, horses, sheep and goats.

EGG-BORNE DISEASES IN HELMINTHS

Tyzzer (51) presented evidence which indicated that Histomonas meleagridis, the etiological agent of blackhead in turkeys, was transmitted through the egg of the cecal worm, Heterakis vesicularis. Shope (45) proved that the virus of swine influenza was transmitted through the egg of the hog lungworm, Metastrongylus sp. Recently, Syvertzon et al. (50) demonstrated that the nematode, Trichinella,
spiralis, transmitted the virus of lymphocytic choriomeningitis to its larval offspring which in turn transmitted the viral disease to guinea pig hosts under experimental conditions.

### TABLE 1

_Diseases Perpetuated in Arthropod Vectors by Egg Transmission_

<table>
<thead>
<tr>
<th>Disease</th>
<th>Biological Agent</th>
<th>Vector</th>
<th>Host Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas fever (17, 48)</td>
<td>Babesia bigemina</td>
<td>Margaropus annulatus</td>
<td>Cattle</td>
</tr>
<tr>
<td>Rocky Mountain spotted fever (43)</td>
<td>D. rickettsi</td>
<td>Dermacontor andersoni</td>
<td>Man</td>
</tr>
<tr>
<td>Boutonneuse fever (6)</td>
<td>D. conori</td>
<td>Rhipicephalus sanguineus</td>
<td>Man</td>
</tr>
<tr>
<td>Scrub typhus (40)</td>
<td>R. tsutsugamushi</td>
<td>Trombicula akamushi</td>
<td>Man</td>
</tr>
<tr>
<td>Phlebotomus fever (36)</td>
<td>Virus</td>
<td>Phlebotomus papatasi</td>
<td>Man</td>
</tr>
<tr>
<td>Colorado tick fever (23)</td>
<td>Virus</td>
<td>Dermacentor andersoni</td>
<td>Man</td>
</tr>
<tr>
<td>St. Louis encephalitis (47)</td>
<td>Virus</td>
<td>Dermannysus gallinace</td>
<td>Chickens</td>
</tr>
<tr>
<td>Equine encephalomyelitis* (49)</td>
<td>Virus</td>
<td>Dermacontor andersoni</td>
<td>Horses</td>
</tr>
<tr>
<td>Dwarf disease of rice (24)</td>
<td>Virus</td>
<td>Nephotettix apicalis</td>
<td>Rice</td>
</tr>
<tr>
<td>Fowl spirochaetosis (20)</td>
<td>Treponema anserinum</td>
<td>Argas persicus</td>
<td>Chickens</td>
</tr>
</tbody>
</table>

* Western

### Diseases Perpetuated in Helminth Vectors by Egg Transmission

<table>
<thead>
<tr>
<th>Disease</th>
<th>Etiological Agent</th>
<th>Vector</th>
<th>Host Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterohepatitis (51)</td>
<td>Histomonas meleagridis</td>
<td>Heterakis vesicularis</td>
<td>Turkeys</td>
</tr>
<tr>
<td></td>
<td>Virus</td>
<td>Metastrongylus sp.</td>
<td>Hogs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trichinella spiralis</td>
<td>Guinea pigs</td>
</tr>
</tbody>
</table>

*SEED-BORNE DISEASES OF PLANTS*

At least three important diseases of plants have been proven to be transmitted from mature plants to the next generation through their seeds (table 2). In 1904 Hecke (26) demonstrated that the fungus, _Ustilago tritici_, which causes loose smut of wheat, was present within the seed and produced the disease in the resulting plant. In 1921 the bacterium, _Xanthomonas thaseoi_, was found in bean seeds and was proven to cause bean blight (8). Bean mosaic, a virus disease, was also shown to be seed-borne (37).
Various workers have obtained evidence which suggested to them that certain avian diseases were egg-borne. The evidence indicating egg transmission is quite conclusive in the case of certain of these avian diseases. However, for many of the diseases there is only suggestive evidence (44). Table 3 lists the egg-borne diseases of birds.

Table 2
Egg-Borne Disease of Silk Worms

<table>
<thead>
<tr>
<th>Disease</th>
<th>Etiological Agent</th>
<th>Host Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pébrine (39)</td>
<td>Nosema bombycis (protozoan)</td>
<td>Silk worms</td>
</tr>
</tbody>
</table>

Seed-Borne Diseases of Plants

<table>
<thead>
<tr>
<th>Disease</th>
<th>Etiological Agent</th>
<th>Host Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose smut (26)</td>
<td>Ustilago tritici (fungus)</td>
<td>Wheat</td>
</tr>
<tr>
<td>Bean blight (8)</td>
<td>Xanthomonas theseoli (bacterium)</td>
<td>Beans</td>
</tr>
<tr>
<td>Bean mosaic (37)</td>
<td>Virus</td>
<td>Beans</td>
</tr>
</tbody>
</table>

Table 3
Diseases of Birds Transmitted Through Eggs*

<table>
<thead>
<tr>
<th>Disease</th>
<th>Etiological Agent</th>
<th>Principal Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pullorum disease (41)</td>
<td>Salmonella pullorum</td>
<td>Chickens</td>
</tr>
<tr>
<td>Fowl typhoid (3, 4, 25)</td>
<td>Shigella gallinarum</td>
<td>Chickens, turkeys, ducks</td>
</tr>
<tr>
<td>Paratyphoid infections (22)</td>
<td>Salmonella sp.</td>
<td>Ducks, pigeons, chickens, turkeys</td>
</tr>
<tr>
<td>Tuberculosis (21)</td>
<td>Mycobacterium avium</td>
<td>Chickens</td>
</tr>
<tr>
<td>Psittacosis (35)</td>
<td>Virus</td>
<td>Parakeets</td>
</tr>
<tr>
<td>Infectious sinusitis (28)</td>
<td>Virus</td>
<td>Turkeys</td>
</tr>
<tr>
<td>Avian encephalomyelitis (29, 52)</td>
<td>Virus</td>
<td>Chickens</td>
</tr>
<tr>
<td>Newcastle disease (30, 53)</td>
<td>Virus</td>
<td>Chickens</td>
</tr>
<tr>
<td>Avian lymphomatosis</td>
<td>Virus-like agent</td>
<td>Chickens</td>
</tr>
</tbody>
</table>

* In most of the diseases listed above the etiological agents have been found in eggs, but it has not been definitely established that all of these agents can cause disease in the hatched offspring as a result of egg transmission.

Pullorum disease.—Pullorum disease was the first poultry disease proven to be transmitted through the egg. In 1909 Rettger and Stoneburn (41) isolated Salmonella pullorum from fresh and incubated eggs, which were laid by hens whose other progeny had died of pullorum disease. Many other investigators have confirmed these findings and have demonstrated that S. pullorum may be present in many eggs laid by carrier hens and that the bacteria can be isolated from the ovary of such hens. Thus, the transmission of S. pullorum from dam to offspring through the egg
has been firmly established as one of the principal methods whereby the disease is perpetuated.

Fowl typhoid.—Beaudette (3) in 1925 suggested that fowl typhoid may occasionally be transmitted through the egg. He isolated *Shigella gallinarum* from the unab sorbed yolk sac of chicks and from the ovaries of adult hens. Beach and Davis (1) made similar observations. Later, Beaudette (4) succeeded in isolating the organisms from the yolk sac of a dead embryo. In the same study it was pointed out that the epizootic evidence indicated egg transmission in many instances. Recently, Hall et al. (25) reviewed the literature on this subject and presented the results of their studies, which demonstrated that *S. gallinarum* was, in some cases, transmitted through the egg. The other methods of transmission were also discussed in this report.

Other workers have reported results which indicated that *S. gallinarum* may be transmitted through the egg in turkeys and ducks (12).

Paratyphoid infections.—The subject of paratyphoid infections in birds has been ably reviewed by Fenstermacher (22). The evidence indicates that the paratyphoid organisms may occasionally be transmitted through the egg, but perhaps more often the eggs become contaminated externally on the shell. Penetration of the eggshell by the organisms has also been demonstrated. Whether eggs carry paratyphoid organisms externally or internally, they have presented a public health problem in some localities, and duck eggs have been the chief offenders.

Avian tuberculosis.—In 1890 Sibley (46) found avian tuberculosis in chickens that had been hatched from eggs laid by hens affected with the disease. The importance of this form of transmission has not been settled definitely, and Feldman (21) has summed up the situation as follows: “The information presented up to the present time is inadequate to support the belief that eggs from tuberculous chickens constitute a factor of importance in the dissemination of tuberculosis from infected to healthy flocks. Although the possibility that this might occur is admitted there is at the present time no convincing experimental evidence to justify the conclusion that chicks hatched from eggs laid by tuberculous hens will be infected with tubercle bacilli as a consequence of the infectious agent having been implanted in the developing embryo during the prenatal existence of the chick.”

Psittacosis.—Meyer (35) found that psittacosis virus could be detected in the ovaries and eggs of infected parakeets. Furthermore, the observation that young birds, even nestlings, have had active infections with psittacosis virus has added further evidence that the disease may be egg-borne. Davis and Vogel (15) inoculated embryonated chicken eggs with psittacosis virus and demonstrated that the agent survived and could be detected for as long as 22 days after hatching.

Infectious sinusitis of turkeys.—Jerstad and Hamilton (28) found the virus of infectious sinusitis in turkey embryos that were the offspring of infected breeders.

Avian encephalomyelitis.—Van Roekel et al. (52) concluded that the virus of avian encephalomyelitis is egg-borne. Jungherr and Minard (29) also came to the same conclusion and presented evidence that the virus was present in the gonadal tissue of certain adult birds.

Newcastle disease.—Brandly et al. (7) demonstrated the presence of antiviral antibodies in the yolk of eggs laid by immune recovered hens. The virus of New-
castle disease was isolated from fresh eggs of infected hens and from ovarian tissues (2, 30, 53). DeLay (16) reported isolation of the virus from the yolk sac of 4-day-old chicks, dead embryos, and infertile eggs from infected parent stock. Hofstad (27) also found that dead embryos and infertile eggs contained the virus when the eggs were examined during the decline in egg production following an outbreak. However, the virus could not be detected in the first eggs laid by such hens when they resumed production. Beaudette (5) was unable to detect the virus in dead embryos and infertile eggs laid after vaccination. The evidence indicates that Newcastle disease virus can be transmitted to the egg, especially when hens are in the period of declining production following an outbreak of the disease. However, due to the embryonic mortality caused by the virus, apparently only a few embryos would survive to hatching time.

Lymphomatosis.—Doyle (18) was the first to suggest that avian lymphomatosis (fowl paralysis) may be transmitted through the egg. Since then many other workers have presented observations and experimental evidence both for and against this contention (13). The evidence favoring egg transmission of lymphomatosis may be classified as follows: epiornithic observations, flock isolation studies, family isolation studies, incubator exposure studies, histological studies, and transmission studies, using blood and tissues of chicks and embryos that were the offspring of diseased and "normal" parents.

Epiornithic observations on the spread of lymphomatosis indicated to some workers that the disease may have been introduced into flocks by the purchase of hatching eggs from infected flocks (18, 34, 54).

Flock isolation studies, such as the establishment of the U. S. Regional Poultry Research Laboratory flock, also suggested egg transmission. In this flock only eggs were introduced into previously unused quarters and the first cases of lymphomatosis were found during the second and subsequent months after the chicks hatched (56).

Family isolation studies were carried out in which only the eggs of individual hens were placed in isolated incubators (55). Thus, each family group of chicks was hatched and reared in an isolated pen. Gross manifestations of lymphomatosis were later evident in the birds of certain family groups, but not in others. This was further evidence of egg transmission (55).

The incubator exposure studies also indicated egg transmission (57). These experiments were carried out with the offspring of isolated dams. Control groups were hatched and reared in isolated pens and their sibs, comprising the test groups, were hatched and reared in incubators and pens with the offspring of non-isolated highly "contaminated" parent stock. Other test groups of sibs were hatched in isolation and then exposed to the non-isolated or "contaminated" stock at different ages following hatching. A significant difference in the incidence of gross lymphomatosis was found between the groups exposed continually from hatching on to termination and the groups that were hatched in isolation and then exposed from one day of age on to termination. The incubator exposed groups had the highest incidence of lymphomatosis. These results were interpreted to indicate that the offspring of the non-isolated or "contaminated" stock were being infected with lymphomatosis through the egg and that they were capable of infecting the test group in the
incubator at hatching time to a greater degree than at any time thereafter. Thus, those hatched in isolation and exposed at one day of age had a lower incidence of lymphomatosis because they missed the incubator exposure (57).

Histological studies have given information relative to egg transmission, especially dealing with a possible mechanism of transmission and the carrier-bird problem (31, 32, 33, 38). If the agent of lymphomatosis causes the formation of lymphoid areas in the viscera and nerves of birds, then there is histological evidence for the presence of the agent in embryos, since such areas have been found in some embryos.

Transmission studies that tended to indicate egg transmission were conducted by Durant and McDougle (19). They inoculated the blood from chicks that were the offspring of diseased parent stock (ocular lymphomatosis) into other susceptible chicks. A higher incidence of neural lymphomatosis was found in the inoculated chicks than in their uninoculated control sibs.

Recently, experiments were conducted at the U. S. Regional Poultry Research Laboratory which showed that a high incidence of lymphomatosis, mostly the visceral type, resulted when susceptible chicks of the isolated stock were inoculated with tissue suspensions prepared from certain embryos (15 and 18 days old) and newly-hatched chicks (14). A cell-free filtrate prepared from the liver tissue of newly-hatched chicks likewise produced a high incidence of lymphomatosis in the recipient chicks. In some of these experiments the “normal” donor embryos and chicks were the offspring of “normal” parents that lived to 600 days of age without showing any clinical or gross evidence of lymphomatosis. These experiments have been interpreted to indicate that certain “normal” appearing hens are “carriers” of the agent of lymphomatosis, that they may have a latent infection, and that they can transmit the agent of lymphomatosis to their offspring through the egg (14).

**DISCUSSION AND SUMMARY**

It has been shown that nearly all types of disease producing agents—protozoa, fungi, bacteria, rickettsia, and viruses—have been proven to be transmitted through eggs or seeds. This type of transmission takes place in certain helminths, arthropods, birds, and plants. In some diseases it has been shown that egg transmission is the only way in which the disease is perpetuated. In certain other diseases egg transmission probably occurs rarely. The diseases that are not egg or seed-borne greatly outnumber those that are transmitted through the egg or seed. Thus, egg transmission, while it appears to be an ideal means of perpetuating a continuous agent-host relationship, should probably be looked upon as an unusual rather than a usual method of transmission.

There are a great many difficulties in unequivocally proving that a disease producing agent is transmitted through the egg. The ideal situation would be one in which the etiological agent could be demonstrated in the dam, isolated from the interior of the dam’s eggs at different stages of incubation, isolated from the hatched offspring, and, finally, in the ideal situation the offspring would remain carriers of the agent or subsequently develop the disease. Not all of these conditions have been satisfied in the study of lymphomatosis. However, two of the most important
steps have been accomplished, namely, demonstration that the agent is present in certain 15 and 18-day-old embryos and in newly-hatched chicks.

The disease that was produced in the recipient birds by the inoculation of certain embryonic and chick tissues was similar, by all criteria employed, to the naturally occurring disease. Likewise, it was similar to the disease produced by the inoculation of cell-free filtrates of lymphoid tumors (9, 10, 11). When susceptible chicks were inoculated with the agent of lymphomatosis during the first few days after hatching, no immediate measurable response was detected. However, after a latent period of sixty or more days some of the inoculated birds began to develop lymphoid tumors. Some of the birds have lived well beyond the breeding age before they developed gross lesions of lymphomatosis. Thus, many birds may harbor the agent of lymphomatosis for long periods of time without showing any clinical or gross evidence of disease, and while in this "carrier" state some of them apparently can transmit the disease to their offspring. In view of the evidence, the conclusion seems justified that lymphomatosis should be considered as another egg-borne disease of chickens.

Since the agent of lymphomatosis may be present in certain apparently "normal" embryos, there is a possibility that this agent could be accidentally incorporated in, and disseminated with, live virus vaccines for other diseases that are prepared from embryonated eggs. However, at the present time there is no evidence for or against this supposition.

The studies on germ-free techniques at the University of Notre Dame (42) have shown that about 95.0 percent of the eggs that they have studied were free of viable bacteria, when proper disinfection of the shell was employed. Thus, avian eggs may be looked upon as potentially germ-free systems, but it is evident that the interior of the egg may occasionally be invaded by disease producing agents, either at the time of egg formation or after the egg has started its independent existence.

REFERENCES


CULTIVATION OF THE CHRONIC RESPIRATORY DISEASE VIRUS IN CHICK EMBRYOS

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Rhode Island Agricultural Experiment Station, Kingston, Rhode Island

In 1943 Delaplane and Stuart (1) described the isolation and propagation of a virus causing a chronic respiratory infection in chickens. More recently Delaplane (2) (3) reported the re-isolation of what he believed to be the same virus. This latter virus was characterized by producing arthritis in chick embryos and also respiratory infection in turkeys. The respiratory infection in turkeys was similar to that of infectious sinusitis. In some turkeys nervous symptoms similar to those of Newcastle disease were also observed.

The symptoms of the chronic respiratory disease as seen in mature chickens cannot be distinguished from those resulting from infectious bronchitis or Newcastle disease. The chronic respiratory disease differs in that it is characterized by a slow rate of spread and persists for months. In contrast, the rate of spread of infectious bronchitis or Newcastle disease is rapid and of relatively short duration. Entire flocks may contract either infectious bronchitis or Newcastle disease and recover within a two-weeks period.

The chronic respiratory disease has not been observed in the field in other than mature flocks except on one farm. It may occur in young birds under field conditions but is not observed, as earlier work has indicated (1) that young chickens manifest a simple coryza without lower respiratory involvement. The disease is of little consequence in causing mortality, but unprofitable egg production may persist for four or five months.

Turkeys are equally or more susceptible than chickens to the virus under laboratory conditions. This fact emphasizes the importance of the studies which may contribute to our understanding the cause or causes of infectious sinusitis in turkeys. Hitchner (4) recently described a virus causing infectious sinusitis in the turkey which, as will be shown later in this paper, cannot be distinguished from that of the chronic respiratory disease of the chicken. Minard and Jungherr (5) and Jung-herr (6) have also isolated a causative agent from an infectious sinusitis of turkeys similar to that described in more detail by Hitchner (4).

MATERIAL AND METHODS

The disease outbreaks from which the various viruses were isolated had typical histories of a chronic respiratory disease involvement and freedom from other known infections such as infectious bronchitis, Newcastle disease, etc.

Birds showing typical sneezing, coughing and respiratory rales were selected for harvesting suitable material. The bifurcation of the carefully removed trachea was severed with scissors heated in a flame and the mucous was collected by means of

1 Contribution #750 of the Rhode Island Agricultural Experiment Station, Kingston, R. I.
a sterile bacteriological loop. The exudate was dislodged from the bacteriological loop by streaking on the surface of an agar slant. The surface of the agar offers sufficient resistance to dislodge the exudate which cannot be accomplished with ease in fluids. One or two cc. of sterile saline were used to wash and suspend the mucous material. The suspended exudate was then removed to a sterile culture tube and frozen at \(-17.7°\) C until the incubated slant from which the portion to be frozen was removed indicated bacteriological sterility and suitability for use in chick embryos.

The only exception to this method was in the case of the isolation previously described (2) in which the exudate was treated with streptomycin* to overcome the bacterial contaminants. Several additional attempts to use streptomycin to overcome bacterial contaminants in isolating the virus resulted in failure before it was found that this antibiotic inhibited the agent. Once it was recognized that it was necessary to use sterile exudate for the initial cultivation of the virus in chick embryos no failures have been encountered. It is possible to obtain sterile exudate from typical specimens approximately three times out of five.

In the early work, 11-day-old chick embryos were inoculated via the allantoic cavity route. No changes were observed in the embryos until the approach of hatching. Turkey embryos died 10 to 12 days after inoculation; therefore, it was decided to use 7-day-old chick embryos so they could be observed over a longer period before hatching. By using 7-day chick embryos as the media for inoculation purposes it was found that the virus kills embryos on the second, third and subsequent post-inoculation days to hatching. Many embryos which reach the age of hatching may pip the shell and die.

The eggs were candled night and morning following inoculation and the dead embryos were harvested. Harvesting was done by aspiration of the a.a. fluid (allantoic fluid) with a 5 or 10 cc. sterile glass hypodermic syringe and needle. A portion of the harvested a. a. fluid was used to inoculate agar slants. The remainder was deposited in 10 cc. “Vacutainer” tubes and stored at \(-17.7°\) C. The “Vacutainer” tubes have sufficient vaccum to permit sterilization by autoclaving so that the stoppers are not forced out by the pressure. The rubber stopper of the “Vacutainer” is immersed in Zepharin before being punctured with the needle of the hypodermic syringe at the time of harvesting or when material is being withdrawn for further egg propagation purposes.

In the early work, laboratory birds were inoculated with the disease exudates of field origin by swabbing the trachea and nasal passages in order to determine the infectivity of the field material being used for chick embryo propagation. This has since been discontinued except where failure to obtain sterile material has occurred. When exudate is collected for embryo inoculation purposes the tracheal mucosa is scraped to obtain additional larger amounts which are stored in the deep freezer at \(-17.7°\) C for possible future use. Should the exudates be unsuitable for embryo inoculation, susceptible laboratory birds may be inoculated for further source material. This procedure has made it unnecessary to maintain the number of iso-

* We are indebted to Dr. Green of Merck & Co., Inc., Rahway, N. J. for the streptomycin used in the studies.
lated pens otherwise required if each sample from the field was used to inoculate laboratory birds.

The lesions produced in the embryos are not consistent in character except for hemorrhages of the amnionic and yolk-sac membranes. Some embryos show hemorrhages of the skin, brain and kidneys in addition to those of the amnionic and yolk sac membranes. The chorioallantoic membrane usually shows diffuse radiating or localized opaque areas with or without appreciable thickening. Occasional embryos may be dwarfed, but not to the extent of that characterizing infectious bronchitis. The hemorrhage of the brain is readily observed as it shows through the skull and skin. On incising the cranium, blood and shattered brain material ooze through the opening. Occasionally fibrinous exudate may be found around the abdominal organs.

One strain of virus was characterized by producing arthritis in the embryos, which is readily observed in fresh specimens. No other field strain has been characterized by producing arthritis, nor was such involvement observed with virus recovered from an infected turkey which has been inoculated with egg-propagated material producing joint involvement (Table I). All the other field strains which have been isolated have produced the various lesions except joint involvement.

**FIELD ISOLATIONS OF VIRUS**

Since the irregular pattern of growth and behavior of the virus used to inoculate 7-day-old chick embryos is similar for all the various isolations, only three will be shown in table form, i.e., Tables I, II and III.

The growth pattern of the first re-isolation of virus in 1947 has been reported elsewhere (2). This virus identified as the Sw. strain, was characterized by producing purulent joint involvement in some chick embryos surviving for six or more days following inoculation. The joint lesions were first observed at the sixth serial passage but after the twenty-fifth passage the number showing such involvement decreased because the bulk of the embryos died before they had time to develop lesions. The incidence of joint involvement characterizing this strain of virus may have been influenced by the selection of harvested material of such embryos for making serial passages.

The Sw. strain of virus was used to infect 24 turkeys on different occasions and resulted in respiratory symptoms (and in some specimens nervous involvement) after an incubation period of 6 to 22 days. Mature chickens immune to both infectious bronchitis and Newcastle disease developed symptoms from 9 to 16 days following inoculation with egg-propagated virus. This indicates that immunity to these infections offered no protection against the chronic respiratory disease virus. Young chicks showed only symptoms of coryza and in this respect the findings agree with those described previously (1).

Virus kept in storage at \(-17.7^\circ\text{C}\) for 13 months was found infective for turkeys (the longest period tested). Virus stored for 18 months has been found viable for chick embryos (the longest period tested).

The serum of recovered chickens from the flock from which the Sw. virus was isolated failed to neutralize Newcastle disease virus, thus serving to distinguish between these two diseases.
Table I shows the re-isolation of virus, designated the sinus strain, from a turkey infected (by intrasinus inoculation) with a. a. fluid from embryos showing arthritis. The typical pattern of growth is shown in 7–8 and 9-day-old embryos.

This turkey showed nervous and respiratory symptoms but gradually recovered except for sinusitis and lower respiratory involvement. The turkey died suddenly while being restrained for examination. Sterile sinus fluid was aspirated and used to inoculate embryos for isolation of the virus.

It is interesting that none of the embryos inoculated with the sinus strain showed joint lesions although the original infective material used for inoculating the turkey (Sw. Strain) had consisted of allantoic fluid of embryos showing such involvement. This would indicate that joint involvement is not a characteristic of the growth of the virus in chick embryos and therefore cannot be used as a basis for differentiation.

**TABLE I**

*Re-isolated virus from turkey (Sinus Strain) Infected with egg-propagated Chronic Respiratory Disease Virus (selected from embryos showing arthritis) using 7–8 and 9 Day Chick Embryos*

<table>
<thead>
<tr>
<th>PASSAGE NO.</th>
<th>NO. INOC.</th>
<th>DATE</th>
<th>AGE OF EMBRYOS</th>
<th>NUMBER OF EMBRYOS DEAD (DAYS FOLLOWING INOCULATION)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10  11  12  13</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>1947</td>
<td>11–1</td>
<td>0  0  0  0  0  1  0  1  2  0</td>
<td>Sterile sinus exudate</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>1948</td>
<td>11–8</td>
<td>0  0  0  0  2  1  2  0  0  0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>1–9</td>
<td>1948</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>1–15</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>1–17</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>1–29</td>
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<td>25 mg. per cc. streptomycin used</td>
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<td>1–29</td>
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<td>No streptomycin used</td>
</tr>
<tr>
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<td>8</td>
<td>2–6</td>
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</tr>
<tr>
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<td>6</td>
<td>2–12</td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>2–19</td>
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<td>0  0  0  2  1  2  0  0  0  0  0  0  0  0  0  0</td>
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</table>

In addition to the number of embryos inoculated for each passage, there was each time a group of six control embryos; they were observed through the same period of time as were the inoculated embryos. There were few or no deaths among the controls during the period of observation.

* Death due to trauma.
Infected turkeys held for observation for over seven months continued to show respiratory symptoms of the disease. During the period of observation individual birds showed improvement followed by relapse. A few birds developed caseous exudates in the sinuses and air sacs.

The Tu. Strain (third isolation) showed the typical irregular pattern indicated in Tables I, II and III. This virus was isolated from chickens in Rhode Island which showed the typical history of a chronic respiratory disease. The virus was used to infect both chickens and turkeys. The flock failed to attain an egg production rate of over 40 percent and was disposed of for slaughter.

The fourth isolation of virus referred to as the Stan. strain was isolated from a flock of chickens in Rhode Island. It too showed the typical pattern of growth indicated in Tables I, II and III. This case is interesting because the owner, who had exposed the flock during the growing period to infectious bronchitis, mentioned that the birds still showed symptoms of a respiratory disease months later. Egg production remained at a good level and for this reason the disease did not greatly concern the owner. The virus isolated from this flock also induced typical respiratory symptoms in chickens and turkeys.

<table>
<thead>
<tr>
<th>PASSAGE NO.</th>
<th>NO. INOC.</th>
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<th>AGE OF EMBRYOS</th>
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<table>
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<tr>
<th>NUMBER OF EMBRYOS DEAD (DAYS FOLLOWING INOCULATION)</th>
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<table>
<thead>
<tr>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterile tracheal Exudate</td>
</tr>
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</table>

In addition to the number of embryos inoculated for each passage, there was each time a group of six control embryos, they were observed through the same period time as were inoculated embryos. There were few or no deaths among the controls during the period of observation.

* Death due to trauma.
The fifth isolation of virus, referred to as the Barr. strain, represents the re-isolation of virus from the replacement flock of the same farm from which the Stan. strain was isolated. The owner had been unable to break direct contact between the old and young flock; hence, the continuation of trouble. The disease occurred in the pullets soon after housing, and egg production failed to exceed 20 to 25 per cent for several months. A conjunctivitis was observed in some of the affected birds and one specimen kept for observation recovered after several weeks. Whether the conjunctivitis was due to the virus is not known, as this was the first time it has been observed. The typical pattern of growth of this virus is similar to that shown in Tables I, II and III.

The Dan. (sixth isolation) strain of virus was isolated from chickens in Rhode Island and shows the typical pattern of growth in embryos. This flock is of interest because the birds were purchased in Massachusetts as layers and housed in a new building. Individuals were observed showing symptoms immediately after delivery. Egg production remained at a low level for months. During the late spring and summer, egg production was good and the owner failed to dispose of the flock prior to growing the replacements. The new pullets housed the following autumn developed the disease from which the virus was re-isolated (seventh isolation) and identified as the W. H. Strain. Direct contact between the old and young flock occurred as a result of using the same building in which some of the old birds were housed.

The eighth isolation, designated the Pa.\textsuperscript{a} strain, was recovered from a flock of chickens in Massachusetts. The owner reported that egg production had been unsatisfactory but further details concerning the flock have not been obtained. It too showed the typical pattern of growth in chick embryos as indicated in Tables I, II and III, and was capable of inciting the typical symptoms in mature laboratory chickens.

The ninth isolation, designated the N. H. strain (shown in Table II) was isolated from chickens from New Hampshire in which the chronic respiratory disease was suspected as a result of submissions made to the Poultry Pathology Laboratory at the University of New Hampshire. Poor egg production was experienced in this flock for several months and it was disposed of for slaughter purposes. The virus caused embryo deaths and lesions similar to those shown in Tables I and III.

The tenth isolation, the G strain, was isolated from exhibition chickens grown and maintained on a commercial poultry farm but kept in segregated quarters. The owner had suspected this infection for at least two years before submitting a specimen for virus isolation purposes. This farm is of interest because the disease has never been observed in the same owner's commercial flock consisting of several thousand layers. This fact indicates the infection is not highly communicable and that direct contact probably constitutes the important mode of spread. The G Strain also shows the typical growth pattern in chick embryos indicated in Tables I, II and III.

Table III shows the typical growth pattern of turkey sinusitis virus supplied

\textsuperscript{a} The flock was referred to us through the courtesy of Drs. Van-Roekel and Bullis of the Department of Veterinary Science, University of Massachusetts, Amherst, Mass.
through the courtesy of Dr. S. B. Hitchner as the thirty-ninth passage of his S-3-400 strain which he recently described. (4)

The virus material was in the dried state when received and no change was observed during the first passage. On subsequent serial passage the pattern resembled that of the chronic respiratory disease as indicated in Tables I and II. The Hitchner S-3-400 virus grown in chick embryos induced respiratory symptoms in turkeys indistinguishable from those produced by the chronic respiratory disease agent.

<table>
<thead>
<tr>
<th>PASSAGE NO.</th>
<th>NO.</th>
<th>DATE</th>
<th>NUMBER OF EMBRYOS DEAD (DAYS FOLLOWING INOCULATION)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>6</td>
<td>1849</td>
<td>7 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>Dried embryo propagated Virus</td>
</tr>
<tr>
<td>41</td>
<td>6</td>
<td>2-17</td>
<td>7 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>6</td>
<td>3-3</td>
<td>7 0 0 0 0 0 0 1 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>6</td>
<td>3-10</td>
<td>7 0 0 0 0 0 2 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>6</td>
<td>3-17</td>
<td>7 0 2 0 0 0 1 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>6</td>
<td>3-24</td>
<td>7 0 0 0 0 0 5 1</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>6</td>
<td>3-31</td>
<td>7 0 0 0 0 0 1 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>6</td>
<td>4-7</td>
<td>7 1* 0 0 0 0 1 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>6</td>
<td>4-21</td>
<td>7 0 0 0 0 0 2 0 0 0 0 0 0</td>
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<tr>
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<tr>
<td>52</td>
<td>6</td>
<td>8-11</td>
<td>7 0 0 0 0 0 3 1 0 1 0 0 0</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the number of embryos inoculated for each passage, there was each time a group of six control embryos, they were observed through the same period of time as were the inoculated embryos. There were few or no deaths among the controls during the period of observation.

* Death due to Trauma.

lesions seen in dead chick embryos are similar to those observed with the chronic respiratory disease.

Virus was recovered from turkeys infected with S-3-400 material and designated the H. Sinus strain (eleventh isolation). The pattern resulted from serial passage in chick embryos is similar to those shown in the Tables I, II and III.

The sinus fluid from the turkey from which the H. Sinus strain was re-isolated was used to infect three mature chickens, two of which developed typical respiratory symptoms such as are induced by the chronic respiratory disease virus. The virus designated the H. C. strain (twelfth isolation) was recovered from the two chickens and showed a typical growth pattern as seen in Tables I, II and III.
The results of using the S-3-400 material indicate that it cannot be differentiated from the chronic respiratory disease agent on the basis of its behavior in chick embryos, turkeys or chickens. Hitchner (4) reports that sinusitis virus is also inhibited by streptomycin further indicating close identity of the virus isolated from sinusitis of turkeys and the chronic respiratory disease agent.

Twenty five mg. of streptomycin per cc. of a. a. fluid (virus) almost completely inhibited the Sw. strain of virus. (data not shown) This amount of streptomycin is used for overcoming bacterial contaminants in isolating either infectious bronchitis or Newcastle disease viruses in this laboratory. The virus was not completely inhibited which probably explains the success in isolating the Sw. strain previously described (2).

The Sw. strain of virus (data not shown) failed to result in embryo mortality in dilutions greater than $10^{-4}$. This indicates a virus of low concentration. Serum neutralization tests using the Sw. virus and serum from recovered birds (recovered birds from source furnishing the Sw. virus) failed to indicate neutralizing antibodies. The fact antibodies are not produced in measurable amounts makes it impossible to use this criterion to show the identity of the various viruses or to identify field infections, thus determination of the disease is dependent upon virus isolation.

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The chronic respiratory disease can be distinguished from infections such as infectious bronchitis and Newcastle disease by the following criteria:

1. The characteristic growth of the virus in chick embryos.
2. The susceptibility of laboratory birds immune to infectious bronchitis and Newcastle disease.
3. The ability of streptomycin to inhibit the chronic respiratory disease virus and not that of infectious bronchitis or Newcastle disease.
4. The failure to demonstrate specific neutralizing antibodies in birds recovered from chronic respiratory disease.
5. The typical history of a chronic respiratory disease outbreak.

These studies have been limited to methods of isolation and propagation of the virus in chick embryos. This phase was considered most important as it indicated the occurrence of the disease in several states and has furnished information of value in formulating criteria for future consideration dealing with filtration and other studies.

Although the chronic respiratory disease virus has been isolated from flocks in several New England states, the author does not believe the disease to be of common occurrence. It is important to study the disease because of the possible significance in turkeys and to explain presumed failures to immunize flocks against infectious bronchitis and Newcastle disease.

**DISCUSSION AND SUMMARY**

During the past two years the chronic respiratory disease virus has been isolated nine times from chickens and once from turkeys. The virus material represented flocks in Rhode Island, Massachussetts and New Hampshire.

From the Hitchner S-3-400 turkey sinusitis material further isolations have been
made from a turkey and chickens which have shown the typical respiratory disease symptoms.

The serial passages of the various isolations, including the S-3-400 turkey sinusitis virus, have followed a pattern of embryo mortality similar to that shown in Tables I and II. Arthritic joints as seen in the Sw. virus failed to appear in any of the other isolations or in the re-isolated virus from the turkey. Its absence indicates that this particular lesion is not specific in character. Possibly the extent of occurrence of arthritic joints was influenced by selecting such harvested material for making the serial passages.

The fact that turkeys were infected with the virus in which they developed sinusitis, lower respiratory involvement and, in some instances, nervous manifestation suggests the possible importance of the infection to turkey production. The results of studies of the S-3-400 infectious turkey sinusitis virus (Hitchner) shows it to be indistinguishable from the chronic respiratory disease agent as far as it affects chick embryos, turkeys and chickens and lends support to the probable relationship between the two diseases.

BIBLIOGRAPHY


AN ADDENDUM TO A REVIEW OF THE LITERATURE ON NEWCASTLE DISEASE

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GEOGRAPHIC DISTRIBUTION

Alder and Hamilton (1) have reported isolation of the virus from chicks in Washington. The virus hemagglutinated and was neutralized by an immune serum.

Beaudette et al (3) recovered the virus from birds in 19 of the 21 counties in New Jersey and from Delaware and Pennsylvania.

Fortner (18) found that the California 11914 strain was immunologically identical with the Becker strain of atypical fowl pest of Germany. The latter, however, produces a septicemia and kills all chickens so that organ suspensions are always virulent while the California strain does not kill all birds, produces encephalitis and brain and spleen emulsions do not transmit the disease.

Newcastle disease has been reported for the first time in Leith, Medlothian, Scotland (19). The outbreak resulted from the illegal movement of live birds from infected premises in Yorkshire. The affected birds and contacts were slaughtered.

Walker (23) records that in the examination of material from 50 farms, Newcastle virus was isolated from 8, of which 6 were in Ontario and 1 each in Quebec and Saskatchewan. The virus had a high titer and was neutralized by a positive serum.

Chu (26) reports isolation of virus from outbreaks at Chungking and Nanking, that these are slightly different from strains elsewhere.

Lucam (32) cites that the disease exists in Germany and Italy as already reported by Brandly et al and Traub, in Tunis (G. Cordier, J. Claveiras and A. Ounais, C. R. de l'Acad. Sci. T. 226, 1948, p. 1050), in Algeria (A. Donatien and G. Gayot, Arch. Inst. Past. Algérie, T. 24, 1946, p. 294), and in Spain (S. M. Lomena, Bull. Office Intern. Epizoot., T. 29, 1948, p. 103). With respect to France, the author records suspicious losses with negative bacteriological findings have occurred in the Departments of Bouches-de-Rhône, Vaucluse, Rhône, Allier and Loire, and that a virus was finally recovered in Rhône in November, 1948. The virus killed two inoculated birds and a liver suspension of one of these inoculated into 10 eggs killed all of them in 24–36 hours. Amniotic fluid after filtration through a Chamberland L 3 gave a sterile filtrate which killed an inoculated fowl and was cultivable in successive lots of eggs.

Faulhaber (38) reported that the first outbreak was diagnosed in North Carolina in May, 1947.

SUSCEPTIBLE SPECIES

Nakamura and Iwasa (5) report that a laboratory cat developed nervous symptoms and died on the third day. The virus isolated was propagated in fowls and
eggs and was neutralized by a Newcastle serum. Attempts to infect cats per os were successful.

Moses (9) lists chickens, turkeys and ring-necked pheasants as normally susceptible and Mongolian pheasants, quail, hamster and sheep experimentally infected.

Pomeroy and Fenstermacher (14) were able to infect ducks, geese, sparrows, pigeons, pheasants, quail, partridge and grouse experimentally.

Beach (21) reports pheasants, partridges, quail and doves as susceptible to inoculation. He also reports the disease to be less severe and less prevalent in turkeys.

**MORPHOLOGY**

Reagan et al (29) records that on the basis of electro micrographic studies Newcastle virus, after 200 passages in hamsters, still has the appearance of egg-propagated virus as originally reported by Bang in that the virus may be filamentous or stringy with a large head and small tail and a diameter of 100–125 μμ.

**VIABILITY OF VIRUS**

Jungherr (7) reported that Giltner and Hall restocked an infected pen (without cleaning) 2 weeks after an outbreak and saw no disease in the birds but after 4–5 weeks several showed significant titers. On sterile strips of burlap held at 29° F. (Humidity 45%), 61° F. (Humidity 51%) and 72° F. (Humidity 7%) be found the virus viable to 13, 25 and 55 days, respectively. On non-sterile strips the virus was viable 22 days regardless of temperature or humidity.

Moses (9) reported that one hour’s exposure to 2% NaOH did not kill all virus, but that double strength formaldehyde fumigation at 85–90° F. and high humidity killed the virus in 24 hours.

Resistance of the virus to chemical agents has been investigated by Cunningham (16) who placed 1 part of virus (0.05 cc having 10⁸ embryo doses) with 9 parts of the agent to be tested and held the mixtures for 3 minutes at room temperature after which 0.05 cc doses were inoculated into eggs. The results showed that the following agents destroyed the virus in 3 minutes: ethyl alcohol 95 and 70%, Tr. metaphen (1-200) undiluted, mercuric chloride 1-1000, Tr. zephiran (1-1000) undiluted, Phemerol (3%) undiluted, Disilyn (10%) 1-512, Phenol 3%, Liq. cresoles saponatus 3%, Lysol 3 and 1%, Creolin Pearson 3 and 1%, Clorox 20 and 5%, Tr. Iodine 2.5 and 1%, Sodium hydroxide 5 and 2%. The following agents did not completely kill: Roccal (10%) 1%, Phemerol (3%) 33%, Liq. cresoles saponatus 1%, Potassium permanganate 1-1000, and Formalin 10%. The following were without any effect: ethyl alcohol 40 and 25%, Tr. metaphen (1-200) 1%, methiolate (1-1000) undiluted, mercuric chloride 1-10,000, Tr. zephiran (1-1000) 1%, Roccal (10%) 0.1%, Phenol 1%, clorox 1%, potassium permanganate 1-10,000, Tr. iodine 0.1 and 0.01%, formalin 1% and 0.01%, sodium hydroxide 0.1% and boric acid 4%.

Beach (21) reports recovery of the virus from the air of poultry houses.

Asplin (44) reported on a study of the viability of the virus after it was observed that in about a third of the first 540 outbreaks investigated after the disease appeared in England in February, 1947, there was a history of feeding swill or butcher’s
offal. This suggested virus in non-eviscerated poultry from Hungary. In January, 1947, virus was actually isolated from the skin of eviscerated frozen Hungarian poultry. To prepare material for investigation, 8 cockerels were inoculated and killed on the 4th day when symptoms developed. Four were plucked, eviscerated and wrapped in paper. The other four were merely wrapped. Two of each group were held at 34-35° F. and the others at -40° F. At intervals skin and bone marrow were examined for virus by bird or egg inoculation. The skin at 98 days and the bone marrow at 134 days still contained virus of the plucked and eviscerated carcases held at 34-35° F., while the non-plucked birds still yielded infected skin at 160 days and infected bone marrow at 196 days. Skin and bone marrow of plucked and non-plucked birds held at -4° F. still contained virus at 300 days. Virus on filter paper and egg shell and in sterile feces on jute bags all held in dry heat at 98° F. was still active at 6, 24 and 72 hours, but inactive at 12, 44 and 90 hours, respectively. Fluid virus at 56° C. was active at 45 minutes and inactive at 60. On filter paper at 34-35° F. it was active at 203 days, inactive at 217, and at 32° F. active at 161 and inactive at 175 days. On glass at 34-35° F. virus was still active at 396 days.

Various disinfectants were mixed with virus at room temperature for 1 hour and thereafter in the refrigerator. A titration before exposure and at intervals after exposure indicated the drop in titer. Thus, 4% sodium carbonate had only a slight effect after 7 days. Lysol 2.5 and 1.0% was effective in 1 minute and 1 hour, respectively. Phenol at 2.5% lowered the titer in 1 hour and killed in 24. A proprietary hypochlorite at 5% reduced the titer in 1 hour and destroyed in 3. Potassium permanganate at 0.4% destroyed in 1 hour and a proprietary potassium permanganate at the recommended 4.0% merely lowered the titer after 24 hours. A commercial coal tar disinfectant at 2.5% was effective in 1 minute and at 0.5% in 24 hours. A second agent of the same type in the recommended concentration of 2% merely lowered the titer in 24 hours.

The effect of formalin varied with the temperature. At 0.2% at 34-35° F., virus was inactivated in 10 days; 2% at 65° F. in 12 hours and 0.1% at 98° F. in 6 hours. Asplin reports that although more than 2489 outbreaks were confirmed between February 1947 and November 1948, no outbreak was attributable to residual virus on the premises.

DIAGNOSIS

Isolation of Virus and Distribution in Body: Osteen and Anderson (2) report recovery of virus from only 14% of tissues submitted.

Beaudette et al (3) examined 1300 tissues from 855 birds in 379 flocks. By egg inoculation the virus was recovered from 105 flocks while 274 flocks were negative. From the former 283 and from the latter 572 birds were examined, that is, 2.69 and 2.08 birds per flock, respectively. The 486 tissues from positive flocks yielded virus in 194 cases (39.91%). Actually, the 194 isolations identified 166 (63.35%) of the 262 birds from which 1 or more tissues were examined. Of the 814 tissues from negative flocks, 574 were determined as such on the first, and 157 by the second passage (90%). The remaining had to be carried from the third to the seventh passage. The distribution of virus in organs varied thus: spleen 50%, ovary 42.55%, respiratory exudate 32.25%, oviduct eggs 30% and brain 19.6%. The highest percentage re-
covery of virus was from young chicks, thus, from 62.82% of spleens from chicks and only 24.28% from pullet spleens, or, from 29.41% of the chick brains and 2.94% from pullet brains. The virus was recovered in a higher percentage from dead (72.5%) than from live birds (61.71%).

Since 4.62 tissues per flock or 1.71 tissues per bird were examined in the case of positive flocks and only 2.97 tissues per flock or 1.42 tissues per bird in negative flocks, it is possible that a larger number of virus isolations would have resulted had more tissue per flock or bird been examined.

Beaudette et al. (4) reported that recovery of virus from Boerner filtrates of suspensions of respiratory exudates was so low that several suspensions were later diluted further and subjected to two kinds of antibiotics, viz. 10,000 units each of penicillin and streptomycin per cc., and a mixture each cc of which contained 0.08 of 1 mg. tyrothricin, 2 mgs. sulfadiazine sodium and 4000 units of streptomycin. Ten birds whose organs and filtrates were negative also gave negative exudates after antibiotic treatment. Eighteen birds of which some organs were positive, but which gave negative filtrates were also negative after exudates were treated with antibiotics. However, in a group of 22 birds which had given positive organs and 14 positive filtrates, the virus was recovered from only two samples treated with the two antibiotics.

Thompson and Osteen (25) explored the value of streptomycin in rendering tissues sterile for egg inoculation. Lung samples were collected separately while liver, spleen and brain were pooled. To each was added several volumes of broth and the pool was ground by a Ten Broeck apparatus and the lung by mortar and pestle. To 1.75 cc of the supernatant 0.25 cc of 200 mg/cc. solution of streptomycin were added and 0.3 cc inoculated into each of 4 (12 day old) eggs after 30 minutes at room temperature. A rough estimate of the bacterial content was made by streaking 0.1 cc before and after antibiotic treatment. Fluids from eggs dying after 24 hours were cultured and reinoculated into 3 eggs if sterile. If these died in 2–3 days the fluids were checked for sterility and neutralization. In toxicity experiments, it was shown that 10 mgs. (10,000 units) was not toxic, that 15–20 mgs. were slightly toxic, that 25–30 mgs. were more so and 35–40 mgs. killed all embryos. Of 258 samples examined, 49 yielded virus. Virus was recovered from only 3 of 85 pools of yolks (2–4 eggs each) and these had been laid at the beginning of the outbreak. At least 13 of the positive tissues could be considered as heavily contaminated, and only 5 positive samples were originally sterile. Direct culture failed to reveal contamination of any sample after antibiotic treatment. The dose used was more than adequate since retesting of 9 heavily contaminated samples with doses from 25 to 3.125 mg/cc gave sterile fluids in every case. In order to detect effect of prolonged exposure to the antibiotic at room and refrigerator temperatures, 4 positive samples were suspended in 10 volumes of broth and 25 mgs. of streptomycin/cc of sample added. A $10^{-1}$ suspension of California virus was similarly treated and held at the 2 temperatures as a control. Virus was recovered from the 4 tissues at room temperature for 24 hours, from only 2 at 48 hours, and from only 1 at 96 hours. The tissue samples at refrigerator temperature were still positive at 7 days. The original titer of the California virus suspension was $10^{-8}$ and this was retained at refrigerator temperature while at room temperature it dropped to $10^{-4}$. 
Beaudette et al (41) reported on antibiotic treatment of 58 mucus samples from 30 outbreaks in comparison with filtration through Boerner filters. To each sample was added 5 cc of broth and after mixing and centrifuging a portion was filtered and to 1 cc of the supernatant was added 1 cc of a solution that contained 10,000 units each of penicillin and streptomycin. Filtrates and antibiotic-treated samples were inoculated into eggs the same day. All dead embryos were tested for sterility and one filtrate-inoculated and 2 antibiotic-inoculated embryos were contaminated but mate eggs were sterile. Two contaminants were fungi and one bacterial. From the 58 samples, 38 yielded virus of which 36 (62%) were from antibiotic-treated and 16 (27.5%) from filtrates. In 20 samples filtrates and antibiotic treated material was negative. In 14 samples, both were positive. In 22 samples, the filtrate was negative and the antibiotic-treated positive, and lastly, in only 2 cases was the filtrate positive and the antibiotic-treated sample negative.

Serum Neutralization (SN) Test: Osteen and Anderson (2) report that flocks with negative history do not neutralize 100 embryo doses, and that flocks with a positive history neutralize 1000 or more embryo doses. They show that pooling 9 negative samples with one positive had no effect on the result, but 19 to 1 positive caused only a 10 fold drop in the titer. Of 329 samples tested 131 neutralized $10^4$ doses or more, 24 neutralized $10^5$, and 174 were negative and were from flocks with a negative history. In order to check degree of agreement among various laboratories, 7 samples with SN values of 0 to $10^4$ were sent to 7 laboratories. In no case did a laboratory diagnose samples of 0 to $10^1$ values as positive and there was complete agreement on samples of $10^6$ and $10^6$ values, but one of 7 laboratories evaluated a $10^3$ sample as $10^4$.

Hemagglutination (HA) and Hemagglutination-Inhibition (HI) Tests: Osteen and Anderson (2) sent 7 serum samples with HI values of 0 to 320 to 9 laboratories and only 5 obtained comparable results.

In conducting the HI test, Beach (6) used 0.25 cc of 2-fold serum dilutions from 1–10 to 1–2560, 0.25 cc of virus (1 or 2 tubes below titer) and 0.5 cc of 1% red cell suspension. The serum-virus mixtures were incubated 5–10 minutes and a reading was made 20–35 minutes after addition of the cells. Negative samples gave $+++$ or $++++$ agglutination in all tubes, but one or more of the first tubes failed to agglutinate with positive samples and the highest dilution of serum inhibiting was termed the HI titer. It was found that birds which had been vaccinated with formalized vaccine were HI negative even though they resisted challenge. In tests on over 200 field samples birds which gave a serum titer of 1–10 or higher resisted a challenge and often showed a SN titer of $10^4$ so Beach considers a 1–10 titer is significant.

Florman (12) reported modification of chicken red cells for as long as 21 days after treatment with influenza (PR8 and Lee) and Newcastle viruses. Although cells treated with PR8 are no longer agglutinated by Newcastle virus after elution, those primarily treated with Newcastle virus are subsequently agglutinated by PR8. On the other hand, when chick embryos are inoculated intra-allyantoically with either virus (PR8 or Newcastle) and reinoculated 24 hours later with the heterologous virus growth only of the virus primarily inoculated takes place.
Schmittle and Millen (24) have described a method whereby egg yolk is used to replace serum in the HI test. To 1.5 cc of yolk, 6 cc of saline is mixed and to this is added 2 cc of ethylene dichloride and 1 cc of reagent ether. The mixture is incubated at 37°C. overnight and centrifuged at 1000 r.p.m. for 10 minutes. The watery supernatant fraction is approximately a 1-5 dilution and is used in place of serum. In comparative tests the HI value obtained with yolk was lower than that obtained with the corresponding serum in only a few cases. Of 118 eggs from 24 normal birds, none was positive but after the hens were exposed the 65 eggs examined were positive.

Luginbuhl and Jungherr (49) have described a plate HI test in which a 1.5% suspension of cells is used (within 48 hours). The California 11914 strain with an embryo M.L.D. titer of 10^-4, titer in 6 months old chick (1 cc intramuscularly) 10^-4, and an HA titer of 128. In comparison with 2 Connecticut strains—one of low virulence—there is no correlation between chicken M.L.D. and the HA titer. The test is set up on a ruled mirror by adding to 0.1 cc (2 drops from a 0.2 cc serological pipette) of serum 0.05 (1 drop) of virus. After mixing with a toothpick or by rotation 0.1 cc (2 drops) of the cell suspension is added and mixed again. A reading is made as soon as the known positive and negative samples are readable or within 3-5 minutes. It is claimed that 60 to 72 may be run in an hour. No agglutination is considered as positive, a fine agglutination as suspicious and a coarse agglutination as negative. In comparative tube and plate tests on 1508 chicken samples there was agreement in 1404 (93.9%), no agreement in 79 (5.2%) and suspicious results in 25 (1.7%).

Seventy-three human sera were tested by SN and plate test with the result that of 38 neutralizing less than 10 embryo doses, and 22 neutralizing 10 doses, none gave a positive plate test. Of 9 samples that neutralized 100 doses, 1 gave a positive plate test and of 4 that neutralized 1000 doses, 3 gave a positive plate test.

Comparison of SN and HI Tests: Osteen and Anderson (2) determined HI and SN values on 6 chickens 4 days post inoculation and found 4 HI positive and 1 SN positive (one not SN positive till 9th day), 1 was HI negative and SN positive and 1 negative to both tests. In a second trial, the 6 birds were positive to both tests on the 5th day post inoculation. In a third trial on 11 birds only 2 were HI positive at 4 days. At 6 days 10 were HI positive and only 7 SN positive. Thus concluded that a positive HI test is obtained from more birds at an average earlier time than with SN test. In a comparative study on 203 field samples 103 (51%) were positive to both tests and 85 (42%) negative to both. Two were HI negative and SN positive, 3 were HI positive and SN negative, 10 were unsatisfactory for HI test of which 8 were SN negative and 2 positive.

Fabricant (46) used certain modifications for the HI test such as non-treated allantoic fluid, incubation at 25°C. and a 1-40 serum dilution. In interpreting the results a value of 80 was considered as suspicious and 160 as positive. In a comparative study on 56 cases, the HI titer was positive earlier than the SN. This was also true in experimentally infected birds in which the HI titer was positive in from 2 days before to 5 days after symptoms appeared giving an average of its appearance at 2 days post appearance of symptoms. The HI was found to remain positive as
long as the SN results. Birds held as long as 23 months were still positive to both tests. Only one bird out of over 1000 tested failed to develop a positive HI value after exposure to the virus.

**TRANSMISSION, INCIDENCE AND MORTALITY**

In the 3 age groups 1-35, 42-120, and 150-420 days, Jungherr (7) diagnosed 29, 12 and 37 outbreaks, with an average per cent mortality of 11.4, 5.8 and 1.5, respectively. The per cent range mortality for the groups was 0-75, 1-23, and 0-6. Layers lost on an average 80% in egg production.

Byerly (8) reported the incidence in the broiler section of the Eastern shore as about 30%. Visits at 83 farms were made and 49 blood samples tested of which 22 were positive. It was observed that while the normal loss (12-18 weeks) was 10% Newcastle affected flocks lost an average of 20%. It was considered significant that in a study of 148 outbreaks in 21 states 39 (26%) were in started chicks.

Pomeroy and Fernstermacher (14) reported that a year ago (1946) the disease existed in 13 counties of Minnesota and is now found in 43 counties. The first case was recognized in May 1946. In 73 outbreaks in chicks under 4 weeks of age the average mortality was 34%.

Goldhaft and Wernicoff (15) recorded that while the loss in adults in 1944-45 was about 1% it had risen to about 5% in 1947, and that the ratio of paralysis to mortality was about 5 to 1. The loss in 59753 birds in 25 flocks (5-10 months old) was 3620 or about 5%. In 39000 chicks 10 days old the loss was 20528 and in 2533 (4 weeks old) the loss was 902. An interesting observation was the presence of blood in the trachea that would not produce infection in Newcastle-immune birds that were susceptible to laryngotracheitis.

Beach (21) records mortality varying from 0-50% with an average of 10%. The loss is somewhat less in adults. The disease usually affects all birds but occasionally some escape. In some areas the disease affects chicks particularly, in others it is largely a disease of adults. On many farms the disease tends to reoccur each year and Beach has never seen the same group affected twice. After demonstrating the presence of the virus in the air of poultry houses it was shown that birds confined in cages in houses in, such a way as to exclude all but air-borne infection, contracted the disease.

Walker (23) records a mortality of 50% in chicks 3-4 weeks old and 100% in 12-day-old chicks on the same farm. In 4100 turkeys (2-3 weeks old) the loss was 1300.

Heemstra (34) reports the results of a survey made in the Delmarva area in June 1947. This area of 3200 square miles was divided into 1629 segments of which 40 (2.5%) were surveyed. Every farm of 500 birds or more in each area was visited and 10 birds bled for a test. Of the 83 flocks (928,000 birds) 25 or 30.1% were found to have Newcastle disease and the diagnosis was confirmed by tests of blood samples from 22 of these. The disease was usually found to strike at 1-9 weeks of age but largely at 4 weeks. Only one outbreak started during the first week and by 18 weeks the loss was 50%—marketing had been delayed 4 weeks. Losses in non-affected and affected were usually the same till 7 weeks, but considerably higher in affected flocks after this age. No relation was found between the incidence of the disease and such infections as coryza, coccidiosis, bronchitis or pox and laryngotracheitis vaccination.
Occurrence of the disease appeared not to be related to source of chicks or husbandry practices. Two bad practices were noted viz. that poultry buyers used dirty crates and often swept out trucks on the premises and feed bags were reused.

Byerly (35) compiled voluntary reports on 545 flocks in 176 counties in 21 states, and found that of 171 outbreaks 118 involved young birds, 52 adults and 1 turkey flock. The outbreaks lasted about 4 weeks, most birds became affected and layers suffered a severe decline in production. The mortality was estimated to be 40% for young and 20% for adults. The monetary loss was calculated at $200.00 per affected flock. Of the 188 chick flocks 33 had been obtained as started chicks. Since the area surveyed by Heemstra grows 100,000,000 broilers a year then an incidence of 30% and a mortality of 10% over non-affected flocks results in a loss of 3 million a year. In addition, 50,000,000 chick weeks are lost due to the 2 extra weeks required to finish infected chicks.

Hurt (36) reports that in Los Angeles Co., California, the mortality in birds under 5 months of age varies from 1-90%, that the spread in turkeys is slower, yet, a loss of 40-60% has been recorded.

Faulhaber (38) reports that about 35 outbreaks have occurred in North Carolina and that about 75% have been traced to baby chicks or birds originating in other states. Quarantine and slaughter has been practiced but as of July 13, 1948, the purchase, distribution and use of live virus vaccine is by written permission of the state veterinarian.

OUTBREAKS IN LAYING CONTESTS

A natural outbreak in the Passiac County Contest, New Jersey reported by Platt (13) spread from pen to pen without any relation to the pattern set by the attendant in the routine of his visits. Spread within a pen (13-16 birds) required from 7 to 40 days with a mean of 17.8 ± 0.79 days for leghorns and 18.8 ± 1.12 for heavy breeds. An outbreak also occurred in the Vineland Contest and the loss in 562 birds in the 2 contests was 11 or 2%. Egg production returned in 4-5 weeks. Birds at the Passaic Contest which failed to show symptoms were found to carry neutralizing antibodies.

Beach (43) reports on an outbreak in a California contest of 38 entries of 28 pullets each in which there were 2 entries from each of 6 farms and 3 and 4, respectively, from each of 2 farms. Twenty-six of the entries were from California and 12 from widely scattered states. Entries were housed in separate pens equally distributed in 2 houses, A and B. There was no evidence of disease at the beginning of the contest, but it appeared 4 weeks later (Oct. 28) in 15A, a week later in 36B, and between Dec. 10 and Jan. 10, in 3 more pens in A and 2 in B. Blood samples from 6 of the 7 pens were positive, and 3 more random samples gave 2 positives. Two days before the close of the contest 3 birds from each entry were tested. The 12 pens previously tested gave the same results. Of the 26 pens not previously sampled all three samples from 12 pens were positive, one of 3 samples from each of 6 pens were positive, all of 3 samples from each of 13 pens were negative. Thus, all or part of 22 of the 38 pens had had Newcastle disease, and most of it was presumed to have been acquired at the contest because only 1 pen of each of 4 of the 6 double entries, 1 of one triple, and only two of a quadruple entry gave positive results. The outbreak is reported to have had little effect on the year's egg production and there were no losses. The
results show that an outbreak on a premise does not affect all pens or even all the birds in one pen.

**CARriers AND EGG TRANSMISSION**

Jungherr (7) infected 200 chicks by spraying and examined spleen and air sacs and recovered virus on the 10th, 12th and 19th days. Oral and fecal swabs were examined from the 10th to the 50th day and all were negative except an 11th day fecal swab. Blood samples from the 8th to the 15th day neutralized 10⁶ embryo doses or more. He records that Levine was unable to infect controls by exposure to recovered birds for 30 days, and Pomeroy began 60 days after an outbreak to hatch eggs tri-weekly for 6 months without symptoms or serological evidence of infection in the chicks. And, putting healthy birds in depopulated infected pens or in contact with recovered birds after resumption of production failed to induce infection.

Platt (13) records that mixing hens in the same pen failed to set up the disease even though some of the birds were known to have had the disease in other contests as pullets.

Asplin (44) reports that while most recovered birds appear to be non-infectious, there is evidence that some fowls and turkeys remain carriers.

Asplin (44) injected each of 2 pigs with 2.5 cc of virus which provoked insignificant HI titers. Tests for virus in feces and urine daily resulted in recovery from the urine of one pig up to 18 hours but not later. Similarly, 2 rats inoculated intramuscularly with 10,000 embryo lethal doses and by the mouth with the same dose showed no symptoms and only slight HI values. Feces of per os infected rats showed virus at 24 hours, but not later while both feces and urine of intramuscularly inoculated rats were non-infectious at 24 hours.

Hofstad (48) reported on a study concerning the occurrence of the virus in eggs during declining production, on resumption of production and thereafter. Flock 205 concerned 1300 birds from which egg deliveries dropped from 3200 on January 5 to 525 on January 19. From the latter delivery 216 eggs which had been incubated 10 days were candled and 11 dead and 32 infertile removed. By egg inoculation 6 of the dead germs yielded virus while 12 pools of the infertiles resulted in 9 isolations. The remaining eggs were incubated to the 17th day when they were opened, made into 43 pools for egg inoculation and gave negative results. On resumption of production 10 dozen eggs were obtained and of 177 set, 80 were infertile and 5 were dead when candled the 6th day. No virus was isolated from the 5 dead germs, from the 19 pools of the 80 infertiles nor from a pool of dead embryos at hatching time. To the lot of 26 chicks hatched 20 susceptibles were added which were tested 5, 6, 25 and 38 days later and failed to neutralize even 10 embryo doses of virus. After 3 months the 3 susceptibles tested were still HI negative. SN tests were made on the passively immune chicks with the result that 1 (pool of 2 chicks) sample drawn on the 5th day neutralized 10000 embryo doses, 1 bled on the 16th day neutralized 1000 doses, 1 on the 25th neutralized 100 and 1 on the 38th was negative for 10 doses.

A second hatch was taken off when the flock was midway in production at which time 9 and 18 inocula from dead embryos and infertile eggs respectively were negative. To the 112 chicks hatched 50 normals were added and were still serologically negative 18 days and again at 3 months post exposure. Of the passively immune 1 at
18 days neutralized 1000 doses, 2 samples (one a pool of 2 chicks) on the 23rd neutralized 1000 and 100 doses, respectively, and 2 samples on the 30th neutralized 10 doses in one case and failed in the other. At the end of 3 months 5 birds gave negative HI results and were susceptible to inoculation. In a second flock of 600 production dropped from 435 to 0 in 4 days but it began after a pause of 4 days and increased rapidly. Six birds died and 3 were paralysed. Immediately after resumption of production 360 eggs were incubated and after 7 days 9 dead and 212 infertiles were removed and 10 more dead were removed at 17 days. The 19 inocula from the dead embryos as well as 34 pools from infertile eggs failed to reveal virus. To the 80 chicks hatched 50 normals were added without transmission of the disease. One sample (pool of 2 chicks) on the second day showed an HI value of 640 but at 39 days a sample was negative. After 3 months 4 chicks from the affected flock and 3 contacts were negative by the HI test.

Virus isolation established the disease in Flock 239, and 360 of the first eggs laid after production was resumed were incubated and candled on the tenth day. Eighteen dead and 238 infertiles were removed and at 15 days 2 more dead. The 20 inocula from dead embryos and 41 pools from infertile eggs were negative on subinoculation. To the 80 chicks hatched 60 contacts were placed. From the passively immune single chicks were bled at 12, 13, 20, 24 and 29 days of age with SN of 1000, 1000, 100, 10 and 10 embryo doses, respectively. Birds from both groups at 2 and 3 months were HI negative.

**IMMUNIZATION**

*Inactivated Vaccines:* Beach (21) reports that extensive trials have shown this product incapable of producing complete protection and that nearly all vaccinated birds become infected in 6 months or less. There is, however, lowered mortality and less loss of eggs in vaccinated flocks.

Schoening (45) reported on field trials of 2 commercial inactivated vaccines containing 25 and 50% tissue. The trials were made on a broiler plant. House A originally contained 17,000 suffered a 2.03% pre-vaccination loss, was not affected by a respiratory disease at the time of vaccination at 22-23 days of age. The parent stock was estimated to contain 90% immune birds. The chicks were said to be HI negative before vaccination and no virus had been isolated. One vaccine was used in one wing and the other in the opposite wing of the house in each case. A respiratory disease of high morbidity and low mortality appeared 5 days after vaccination. Of the 16654 in house A, 450 died of coccidiosis between 38-44 days. Nervous symptoms were first seen at 8 weeks. The serum titer 16 days post vaccination was insignificant but 5 days later was 10^4 and was presumed to have resulted from the disease rather than vaccination. No difference was observed in the results of the 2 vaccines. House B originally contained 20,000, had suffered a 5.1% pre-vaccination mortality when vaccinated at 28-29 days of age and at the same time as house A. The parent stock contained an undeterminable number of immunes. At the time of vaccination the chicks in the east wing had a respiratory disease of 2 days duration—bronchitis and/or Newcastle. The mortality in the east wing was 95 on the 2nd day post vaccination and 289 the next, but dropped to 7-12 per day in the next 6 days, that is, to about the level in the west wing (2-3 per day). Eighteen days post vaccination a
loss of 22 in the west wing suggested a break, but it did not materialize. Nervous symptoms first seen in the east wing 2 weeks post vaccination and at 4 weeks in the west wing. Samples 6 days after vaccination were negative but those on 16, 21 and 26 days neutralized 10⁴ or more embryo lethal doses.

The original 20000 in the control house C had suffered a 6.14 prevaccination loss and both wings had suffered from a respiratory disease of 2-3 days duration when the other houses were vaccinated. The amount of parental immunity was about that of house B. The east wing had a higher disease incidence than the west reaching a peak of 683 at the 36th day of age. The first nervous symptom seen at 7 weeks. The neutralization titer 6 days post vaccination of the other houses was insignificant but rose to 10⁴ and 10⁵ at 16 days. On the basis of neutralization tests for bronchitis and Newcastle, it was concluded that both diseases were present concurrently.

All costs were figured including the cost of Newcastle vaccination (1.73 cents per bird) and in the end the net profits for houses A and B were $1,081.40 and $1,680.17, respectively, as contrasted to a net loss of $76.60 for the non-vaccinated house.

**Live Virus Vaccine:** Van Roekel et al (11) identified a relatively avirulent strain which when applied by a wing stick produced a “take” in from 2 to 5 days. Applied to 36 laboratory birds (9-25 weeks old) one bird developed nervous symptoms in 22 days. Two birds challenged at 68 and 78 days and 12 and 29 days demonstrated resistance. Used on 11,600 birds (9 weeks-18 months old) on 6 farms caused no respiratory or nervous symptoms. Young birds showed a decline in feed consumption and layers reacted adversely.

Reagan et al (17) adapted the virulent California strain 11914 to hamsters and after 29 passages by intracerebral inoculation found it to be relatively avirulent. Two groups of 42 chickens (10 weeks old) were each given 0.5 cc of a 10% brain suspension (29th passage), the one in the wattle, the other into the breast muscle. In each group 6 died (4 of typical Newcastle) and of the 36 remaining for challenge at 38 days (0.25 cc of 10⁻³) 34 survived in the first, and 32 in the second group. Of the 8 contacts in each group none contracted the disease and on challenge 3 died in each group. The 49th passage in doses of 0.5, 0.25 and 0.1 cc produced 2 typical deaths, but 26 died of an atypical disease out of 104 inoculated. Of the 66 challenged, 62 survived. On the other hand, when the 49th hamster passage was passed once in eggs and the same doses of a 10% suspension of egg fluids used, 26 birds of 93 inoculated died of typical Newcastle and 3 of atypical disease. Of the 64 challenged, 59 survived. A 37th hamster passage produced death of a sheep on the 8th day and a 10% brain suspension of the sheep was used to vaccinate 40 and 50 birds with 0.5 and 0.25 cc, respectively. None died of typical Newcastle but 9 were lost from atypical disease. Of the 68 challenged, only 44 survived.

Bankowski and Boynton (20) used a modified Simms-Sanders medium already used by Boynton for propagation of hog cholera virus. Chicken and bovine serum ultratitrates with physiological solution containing fresh tissue (liver and hearts of 10-13 day old embryos). Cultures were incubated at 37°C for 72 hours, then at room temperature for 24 hours. The bovine ultratitrates series was carried through 10 passages, and the 5th passage of this was used to initiate the chicken ultratitrates series. After one passage the cultured virus failed to hemagglutinate but retained its virulence for embryos of which the fluids hemagglutinated. The viability of each
passage was tested in eggs and 2 chickens (age not stated). The egg titer varied from $10^{-8}$ to $10^{-7}$ with bovine ultrafiltrate and as shown by chicken inoculation the strain tended to become apathogenic. Thus, of 14 chickens inoculated with 4th to the 10th passages, 10 developed no symptoms and even though they had low HI values they resisted (time not given) a challenge of 200,000 chicken M.L.D.'s. The strain cultivated in chicken serum ultrafiltrate did not show such a strong tendency to modification.

Beach et al (28) used 3 strains (C-11914 and Mont) for yolk sac inoculation which had already been through 356,181 and 6 passages respectively by the allantoic route. The first 2 were highly pathogenic, the third only moderately so. Allantoic fluid was used as seed virus and passages were periodically tested for virulence in 30–60 day old chickens. The 11th yolk passage showed little change, but from the 21st passage on the change in pathogenicity was erratically downward. The antigenicity of $10^{-8}$ and $10^{-7}$ dilutions was as great as non-diluted material and the incidence of symptoms was as great whether administered by stick or by intramuscular routes even though the latter dose was 10–15 times greater. In spite of lowered virulence for chickens, that for embryos showed no change. Of 100 birds exposed to birds inoculated with yolk sac passaged virus, 96 did not take the disease, 3 had subclinical infection and one developed the clinical disease. Two hundred birds of a lot of 300 were inoculated by the stick method with the 54th yolk sac passage of strain 11914 with the result that 16% developed nervous symptoms in 10 days and either died or were killed. Thirty of the inoculates showed high HI titers but none of the 100 contacts showed symptoms and of the 40 tested none showed an HI titer. Failure to spread was attributed to the fact that none of the clinical cases were of the respiratory type.

After 30 yolk sac passages a series of allantoic sac inoculations was initiated. The 21st passage tested in $10^{-8}$ to $10^{-7}$ dilutions produced the loss of 1 of 2 birds that received the $10^{-2}$ dilution. The survivors were HI positive and resisted challenge. A second allantoic series was started with the 53rd yolk sac passage of each virus and this time the 19th passage was avirulent when tested non-diluted to $10^{-7}$, survivors were HI positive and resisted challenge with the C strain. However, those that received the 11914 strain produced antibodies only when given the larger doses, that is, $10^{-1}$, $10^{-2}$ and $10^{-4}$—the others provoked no response.

The 3 strains were also propagated in duck eggs by allantoic and yolk sac inoculation with no change after 28 allantoic or 10 yolk sac passages. In fact, the Mont strain became more active.

Lillie (30) compared the antigenic response in 6 week old chicks at 10, 20 and 30 days to an injection of 0.5 cc of a 10% brain suspension of the 51st hamster passage and to 0.5 cc of a 10% solution of fluids from eggs inoculated with a 146th hamster passage. At 10 days 57% of the chicks inoculated with hamster virus were protected while only 6.7% of those receiving egg virus survived challenge. At the 20 day challenge the per cent survival for the 2 groups was 84.7 and 35.3 and at 30 days 83.2 and 37.0, respectively. Survival of the controls for the three periods was 10, 13.3 and 30%, respectively. The contact controls remained healthy, and on challenge 27 of the 28 in contact with the hamster-vaccinated chickens were immune and 26 of the 28 in contact with egg-vaccinated chickens survived.

Hitchner and Johnson (31) record a low virulence strain that produces no reac-
tion in adults, only occasional respiratory symptoms in chicks, and no nervous symptoms. The vaccine consists of a 20% suspension of whole embryo, prepared in a Waring blender and filtered through cotton. The dose of 0.05 cc is administered in one nostril. Two lots gave an embryo titer of $10^{-4}$ and $10^{-3}$, respectively. Used on chicks 1-94 days it produced HI titers of 20-160 when tested 10 to 115 days post vaccination, and the birds resisted a challenge of California Strain 11914. Chicks vaccinated by the stick method showed no HI titer and no immunity. Chicks vaccinated at a day old had an HI titer of 160 at 56 days and 40 at 115 days. Chicks vaccinated at 1, 16 and 39 days of age and challenged from 1-6 days later to determine relation of age to response showed that chicks vaccinated at 1 day gave the first evidence of immunity 4 days later, but was not complete until the 6th day. Those vaccinated at 16 days showed solid immunity from the 4th day on and those vaccinated at 39 days were immune from 24 hours on except one of the 2 challenged on the second day. Vaccinated chicks were a source of inapparent infection for contacts as determined by HI titers. In 4 exposure tests, the contacts showed the titers at 10, 13, 17 and 26 days. Production in 12 layers was not affected by vaccination nor by the challenge 36 days later. From this group, 53 chicks were hatched (whether before or after challenge not stated), but on challenge of small lots at 1, 7, 16 and 48 days the per cent paralysis was 60, 50, 27 and 71, respectively. Also, a lot of 7 was vaccinated at one day of age and challenged at 40 days with no mortality or paralysis.

Clancy et al (39) records that a 6th hen egg passage of virus, after 11 passages in duck eggs was observed to be relatively avirulent for chicks 4 weeks old when $10^{-4}$ and $10^{-3}$ dilutions were administered by the stick method. Of 120 (3-4 week old) chicks so treated, one died and on challenge 13 days later, 114 of the 119 survived. Susceptible chicks placed with vaccinates 5 days post vaccination developed serum titers but not when added at 41 and 83 days. The duration of immunity was such that of 10 challenged 110 days post vaccination, 2 sickened and 1 died. Appreciable titers were found in chicks hatched from hens vaccinated a year previously. The interesting observation is made that whereas hen egg virus produces a readable take, duck egg virus rarely causes one.

Field results on the use of the 12th passage of the above strain are reported by Markham et al (40). The loss incident to the vaccination of 37040 chicks (4-5 weeks old) is reported for various groups as ranging from 0.5 to 3.18% for an average of 1.36% in 21 days. In another trial the loss was 6.1 and 1.89% in 2 lots of 2000 and 3500, respectively, as against 9.5% in non-vaccinated birds. Of 60 challenged post vaccination only 1 died.

Beaudette et al (50) records the identification of a relative avirulent strain from a collection of 105 screened. This strain was originally avirulent or had become so after only 3 passages in eggs. Used on 2884 chicks (30-36 days old) by the stick or intramuscular methods caused a loss of 1.73% from all causes in a period of about 3 weeks. In 8715 chicks (29-36 days old) vaccinated by the intramuscular route the loss was 1.64. In a total of 83058 on commercial farms (29-169 days old) the loss was 1.82. On a farm where the disease existed in the laying flock the loss in 4732 chicks (29-56 days old) incident to vaccination was 7.5% and they resisted the natural disease whereas non-vaccinated lots totalling 2775 got the disease at 6 to 29 days of
age and the mortality ranged from 66 to 100%. On one farm where the first 6 hatches has suffered losses of 21 to 48%, the next 3 hatches were vaccinated soon after the disease appeared in them but the loss was less than 6%. When half of the chicks in 2 small lots were vaccinated the contacts, after 28 days exposure, still showed over 50% susceptible to a challenge. Although the practice is not recommended, the effect of vaccination on laying birds is in proportion to the rate of production. Production drops to a low point (20% of pre-vaccination level) and returns to normal in about 28 days even when the pre-vaccination rate is 65–70%. Birds coming into production may not drop at all, but do not increase as formerly, while birds laying at 30–35% drop to 10–12% and return to the former rate in about 3 weeks.

MULTIPLE VACCINATION AND COMPLICATIONS

Brandly (10) reported that the use of live virus vaccine in Wisconsin brought out such latent diseases as blackhead and coccidiosis.

Multiple vaccination with Newcastle and fowl pox was first suggested by Van Roekel et al (11). Beaudette (37), however, advises against this combination because both viruses produce a systemic reaction. The practice is especially dangerous in areas where Newcastle has to be applied at 4 weeks of age because the approaching coccidiosis season is likely to magnify the loss. Nor should Newcastle and bronchitis immunization be done at the same time for the same reason. On the other hand, Newcastle and pigeon pox vaccines may be applied at the same time because the pigeon virus produces no shock. The practice should be limited only to older birds, however, because durable immunity from pigeon virus depends on the number of follicles infected and a young chick has neither a large area nor well developed follicles. Finally, Newcastle and laryngotracheitis may be applied at the same time because the later causes no systemic reaction and young birds respond with appropriate immunity. Discussing other factors related to immunization, it is pointed out that flocks supplying eggs for vaccine production should be pullorum-clean so that vaccine will be free of the pullorum as well as the typhoid organism. Regarding duck eggs used for virus production, it is pointed out that these are often contaminated with the paratyphoid organism and that there is no reliable test for the identification of breeders which carry the disease.

IMMUNOGENIC RELATIONSHIP WITH POLIOMYELITIS

Reagan (33) records that intracerebral inoculation of monkeys with hamster-adapted Newcastle virus produced symptoms similar to those caused by poliomyelitis virus, but that egg-propagated virus failed to cause such symptoms. Intramuscular, intranasal, intradermal and subcutaneous injections of hamster or egg virus, on the other hand, failed to produce symptoms. The egg virus provoked a greater antibody response than hamster virus. Two groups of monkeys were subjected to a series of injections with the types of virus (egg and hamster) and with controls challenged with poliomyelitis virus. The controls developed symptoms in 6 days and only 2 of 14 survived. Those injected with egg virus developed symptoms in 9 days after challenge and 4 of 10 survived while those given hamster virus developed symptoms in 7 days after challenge and only 2 of 10 survived.
Pomeroy and Fenstermacher (14) mention eye infection in a laboratory worker. Howitt et al (27) reported that a mild central nervous infection has occurred in middle Tennessee and has been associated with an influenza-like disease in adults. There have been no fatalities and no residual paralysis. All sera have been negative for eastern and western equine encephalomyelitis and the St. Louis virus, and fecal samples inoculated into monkeys have been negative for poliomyelitis. Because of the association of most cases with chickens, it was thought advisable to check for Newcastle disease. Since tests on 78 samples of blood collected during 1944–45 gave no positive neutralization and the only positives were found in 1947–48, that is, after Newcastle disease was found in chickens in the area, the possibility appeared promising. Briefly, numerous positive neutralizing sera were identified in persons who had had either an influenza-like or poliomyelitis-like disease, but in no case was virus recovered. After publication, the authors discovered that freshly collected normal human serum frequently gives a positive neutralization test and that such a false positive reaction is destroyed by heating the serum before hand.

Hurt (36) mentions that cases of conjunctivitis developed in 2 persons who had handled birds affected with Newcastle disease. Whether these were diagnosed by laboratory methods is not stated.

Another outbreak of supposed Newcastle infection has been reported by McGough (42). In this instance, chicken was served on Sept. 19, 1948, to a family of 4 of which only 3 partook of the chicken. On the 22nd and 24th, a child and an adult sickened. A third person (adult) became ill on the 28th after a second serving of chicken on the 26th. Blood samples were tested at the Montgomery laboratory and reported as positive, but since these persons had had no contact with affected chickens and since the disease was of the influenza type, it may be presumed that this is another instance of false-positive reaction due to using non-heated serum. In a supplemental report high serum neutralization values are recorded in a family of 10 of which 9 had had contact with a flock of 400 chickens which had a disease that killed 8 and caused depression of production. In this case the chicken samples neutralized 1000 embryo doses so that the outbreak may have been Newcastle, but again, the disease in the humans was of the influenza type and not a conjunctivitis.

Ingalls (47) has recorded 2 authentic cases of Newcastle disease infection of the conjunctiva. One of these concerned a broiler grower whose flock was affected and positively diagnosed by HI tests and virus isolation. The owner developed a conjunctivitis 3 days after the flock became affected and when seen the eye infection was of 3 days duration. Material was collected from the patient that day which exhibited edema of the lids, hyperemia of scleral and conjunctival vessels and a mucopurulent discharge. The infected swab was washed in 1 cc of vehicle to which was added 5000 units each of penicillin and streptomycin, held at room temperature for 30 minutes and inoculated into each of 3 eggs (9 day's incubation) in a dose of 0.15 cc. All embryos were dead on the morning of the 3rd day. The egg fluid hemagglutinated and was inhibited by a positive serum. The titer of the virus in eggs was 10⁻⁷, and on inoculation into 2 cockerels (HI negative) and 1 vaccinated cockerel (HI positive) resulted in râles in the susceptible birds 4 days later and no
effect on the vaccinated bird. Ten days later all birds were HI positive. Serum from the patient a month later was strongly HI positive and an SN test (by the B.A.I.) was strongly positive. The second case concerned a veterinary student who had autopsied a chicken on Nov. 21, and 2 chickens on Nov. 22, both of which were diagnosed as Newcastle by HI tests and recovery of the virus. The student developed a conjunctivitis Nov. 23. Exudate was collected and treated as in the previous case. Of the 4 eggs inoculated, 2 died on the 3rd day, and fluid from these was subinoculated into 4 eggs (12 days old) all of which died in 48 hours. The fluid of these hemagglutinated and was inhibited by a positive serum. The virus titered $10^{-8}$ in eggs and the B.A.I. reported a positive SN. The case persisted for one week.

HANDLING AN OUTBREAK

A popular report by Worcester (22) of the experience of a poultryman who believed that increasing the amount of milk and cod liver oil 5–15 times brought affected flocks back into production in 2–3 weeks compared to 44 days otherwise.

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Significant progress in research on transmissible diseases of poultry and in the control of such diseases has been accomplished during 1949.

SALMONELLOSIS

The incidence of pullorum disease among breeding and hatchery supply flocks tested has been reduced to less than one per cent. The “Pullorum Tested” class of the National Poultry Improvement Plan has been dropped and many of the states have eliminated the remaining tolerance class, “Pullorum Controlled”. However, the pullorum problem is by no means solved.

Further research on the selection of strains of the pullorum organism and of techniques for the preparation of antigens which will unmistakably identify birds affected with so-called regular pullorum, with a minimum of non-specific and doubtful reactions is needed. Numerous complaints have been received by the Bureau of Animal Industry with respect to apparent hypersensitivity of commercially produced whole-blood antigens. It was the opinion of the National Plans Committee on Standardization of antigens and procedures in testing for pullorum disease, at their Ithaca meeting in June 1949 that hypersensitivity in antigens is primarily associated with (1) strains of S. pullorum used and (2) media on which strain cultures are grown in the production of antigens. It was noted that strain 10, commonly used with strains 4 and 11, has developed a tendency toward hypersensitivity. Research on the suitability of various strains and search for a single suitable strain must continue. Non-specific reactions present and probably will continue to present problems.

Variation in the antigenic structure of S. pullorum and the corresponding agglutinin response in infected birds has led to the development of variant and polyvalent antigens. It is evident that the use of standard antigens alone fails to remove all the carriers of S. pullorum from some flocks. Dr. Pomeroy (1949) reported at the Ithaca meeting that about 20 per cent of all pullorum isolates in turkeys in Minnesota in 1948–49 were typed as variants. Thirty of 100 S. pullorum strains isolated by Dr. J. O. Alberts (Graham, 1949) from pullorum outbreaks in Illinois were of the variant type. Polyvalent whole blood antigens are being used routinely in some of the states, these appear inclined to yield many non-specific reactions.

No unusual losses from Salmonellosis have been reported during the past year. The so-called Canadian variant of S. pullorum (XII variant) has been reported from most of the poultry rearing states, and several states are now regularly typing all strains of S. pullorum isolated from poults. This procedure has aided in locating
the flocks which are infected with the variant strain, and in turn, has aided in the organization of control programs for its elimination.

Research work on methods for improving antigens for simultaneous detection of both the standard and variant types in poultry flocks is under way in several laboratories of the United States and Canada. Wright (1949) has found by form variation studies that *S. pullorum* gives rise to two antigenically different strains; one the standard type having a strong XII₂ factor and a weak XII₁ factor (IX XII; XII₂ (≠) XII₁) and the other, the variant type, having a strong XII₁ factor and a weak XII₂ factor (IX XII₁; XII₂ XII₁ (≠)). Attempts to get a stable antigenic strain having all the components have not been successful.

Fowl typhoid has continued to cause high mortality in some areas. Hall, Legenhause and MacDonald (1949) and Gordeuk, Glantz, Cullenback and Thorp (1949) have reviewed the status of this disease and reported studies on its nature and transmission. According to Hall et al, fowl typhoid is a warm weather disease and the infected bird is the most important reservoir and the worst disseminator. They recommend the agglutination test as an aid in detection of the carriers. Prompt removal of such carriers is of prime importance in preventing the spread of the disease. Gordeuk et al concur with these observations. They found that mash contaminated with infected feces and fed for 10 successive days resulted in acute outbreaks with losses of as high as 59 per cent.

At least two new types of *Salmonella* have been reported from poultry during the past year. Both of these, *S. canoga* and *S. corvallis*, were isolated from turkeys (Edwards and Hermann, 1949, and Bruner and Moran, 1949).

The role of antibiotics for prevention and control of this group of diseases is not yet clearly understood. Gwatkin (1949) was able to greatly reduce mortality from pullorum disease in chicks when streptomycin was given orally in the early stages of the disease, but it had no effect when given after symptoms appeared. A new antibiotic neomycin appears to have merit as a preventive for these diseases, according to Waksman, Frankel, and Graessle (1949).

*Salmonellae* as factors in food poisoning from eating contaminated poultry and egg products continues to be a subject of research. A brief review of this subject has been prepared by Schneider and Gunderson (1949). In this report they demonstrate the possibility of spread of such infections in poultry dressing plants. In an examination of 1014 eviscerated "normal" chickens picked at random in one plant, 4.4 percent of them yielded one or more salmonella types. They found that the skin of frozen birds showed significantly smaller numbers of *Salmonellae* than that of freshly chilled birds. Brown and Gibbons (1949) have suggested that isolation of enterococci from processed egg products can be used more efficiently than *E. Coli* as an index to fecal contamination of these products.

Reports from different sections in this country reveal that respiratory infections, exclusive of Newcastle disease, are of great concern to the poultry industry. In some areas the incidence of infectious bronchitis exceeds that of all other respiratory infections. The so-called "chronic respiratory disease" is also of concern to flock owners in some areas while turkey sinusitis remains a serious problem to the turkey industry.

For proper evaluation as to the prevalence of these different respiratory infec-
tions, the diagnostic facilities should be increased and more complete surveys of outbreaks should be instituted. Furthermore, fundamental research is urgently needed regarding the various aspects of these diseases with special emphasis being given to their control.

Sinusitis of Turkeys. Hitchner (1949) has reported having obtained promising results with streptomycin as a treatment for this disease. The birds treated were those artificially infected with the embryo propagated causative agent (Hitchner 1949b). Prompt recovery is said to have followed injection of 0.6 cc. of an aqueous solution containing 150 mg. streptomycin into the swollen sinuses. Aspiration of the exudate in the sinuses before injection was not necessary. Five birds manifesting only lower respiratory symptoms recovered following injection of 150 mg. or 250 mg. streptomycin into the dewlap. Since all the birds were killed following recovery, it is not known whether the cure was permanent.

A report by Bryan, Prier and Grace (1949) indicated failure in attempted experimental transmission of sinusitis by direct contact, Seitz (E K) filtrates of sinus exudate and allantoic fluid of inoculated chick embryos.

Treatment of affected sinuses with 4% silver nitrate was effective in curing the disease. Sodium sulfamerazine and tyrothricin were ineffective.

Hexamitiasis of Turkeys. McNeil (1949) reported marked reduction in mortality among turkey poults was obtained by substituting a mixture containing 3 per cent dried whey (50 to 70 per cent lactose) in a 1:2000 solution of copper sulphate. The use of this mixture was based on the finding that associated with the disease are both a low blood sugar level and reduction of the amount of amylase, the starch splitting enzyme, in the small intestines. This was interpreted as indicating that in hexamitiasis a physiological starvation takes place because of the inability of the birds to utilize the starches fed them. The benefit effected by the whey-copper sulphate is attributed in part to the fact that lactose can be absorbed in the lower part of the small intestine. It is also thought that the lactose favors growth of acidophilic bacteria with resultant increase in acidity in the intestine, and recovery of amylase action in the duodenum. Five to seven days is said to be the optimum duration of treatment. Repetition of the treatment after 3 to 5 days is said to be sometimes necessary.

In spite of the publicity attending the invasion and spread of new diseases such as Newcastle disease, the group of conditions commonly termed fowl paralysis or avian leukosis complex remains the number one killer of adult poultry with an estimated loss of $60,000,000 annually. The importance of the subject is brought out by Dr. Cottral's paper on this program. In a study over a period of 12 years, Hutt and Cole (1948) demonstrated that selective breeding offers an effective method of controlling losses from avian lymphomatosis; the resistant line showed a reduction in neoplastic mortality from 15 to 5 per cent, the susceptible line, an increase from 15 to over 39 per cent. The experiments were conducted under simulated field conditions providing for adequate exposure. Similar experiments conducted under ultra-sanitary conditions at the U. S. Regional Laboratory at East Lansing, Michigan, likewise indicated the possibility of developing, through selective breeding, lines of chickens much more resistant than other lines. However, the development of absolutely resistant lines has not been achieved. In addition to the
above findings Berley Winton (1949) emphasizes in the tenth annual report of the Laboratory, that the virus-like etiology of visceral lymphomatosis seems established although the unity or plurality of the etiologic agent is uncertain. The most important findings from the practical standpoint are the transmissibility of the lymphomatosis agent through the egg and by contact via the feces and the respiratory tract, thereby placing this neoplastic condition definitely into the class of infectious and contagious diseases. This concept is further supported by the demonstration of apparently healthy carrier birds, which however, are not recognizable by serologic tests at the present time.

**NEWCASTLE DISEASE**

Newcastle disease is widespread. Mortality varies from negligible to 80 per cent or more, tending to be higher in chicks under 4 weeks of age. Laying hens suffer depression in egg production, usually sharp and sometimes complete for two to six weeks. Goldhaft and Wernicoff (1948) reported that the ratio of paralysis to mortality in adults observed by them was about 5:1. Alberts (Graham, 1949) reports that Newcastle disease was second only to pullorum in number of cases diagnosed in Illinois in 1949 but showed only a slight increase over 1948.

*Susceptible Species*

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Howitt et al (1948) reported that numerous positive neutralizing sera were identified in persons who had had either an influenza like or poliomyelitis like disease but in no case was virus recovered. After publication, they found that freshly collected normal human serum frequently gives a positive neutralization test and that such a false positive reaction is destroyed by heating the serum beforehand. Ingalls and Mahoney (1949) have recorded two authentic cases of Newcastle disease infection of the conjunctiva by virus isolation.

**DIAGNOSIS**

*Virus Isolation.* Beaudette, et al (1948) recovered virus from 166 of 262 individual birds from flocks diagnosed as infected by embryo inoculation.

*Serum Neutralization.* Osteen and Anderson (1948) in cooperation with seven laboratories reported that no laboratory diagnosed as positive samples of $0$ to $10^4$ values, there was complete agreement on samples of $10^4$ and $10^6$ values but one laboratory evaluated a $10^8$ sample as $10^5$.

*Hemagglutination Inhibition.* Lugenbuhl and Jungherr (1949) have described a plate hemagglutination inhibition test which may be read within 3–5 minutes. In comparative tube and plate tests on 1508 chicken samples there was agreement in 93 per cent, no agreement in 5 per cent and suspicious results in 2 per cent.
Transmission. A high incidence of cases have been traced to interstate shipments of chicks. While the agent has been isolated by several workers from eggs and dead embryos from acutely infected flocks, careful and extensive tests by Hofstad failed to demonstrate transmission of Newcastle by chicks hatched from infected flocks. Delay (1947) has isolated Newcastle virus from the yolk sac of 4-day old chicks which indicates the possibility of egg transmission.

Beach (1949) reported that infection spread from vaccinated to non-vaccinated susceptible birds in adjoining pens and in other houses. He recommended that ordinarily use of live-virus vaccine should be limited to young birds on farms on which the adult population, if any, is immune.

IMMUNIZATION

Inactivated vaccines. Beach (1949) reports extensive trials, which show this product incapable of producing complete protection, nearly all birds becoming susceptible in 6 months or less following vaccination. There is however, lowered mortality and in laying flocks vaccinated less loss of egg production.

Live-virus vaccines. Illinois (Graham, 1949) reports that for 150,000 pullets 3½ to 8 months of age in 537 flocks vaccinated with commercial live virus vaccine, less than 1 per cent of vaccinated birds died from all causes in the two week post-vaccination period. A 40–95 per cent drop in egg production was suffered by pullets with production above 25 per cent when vaccinated. Pullets usually returned to pre-vaccination production levels in 2 to 6 weeks but two flocks failed to do so. Selected pullets were resistant to Newcastle 4 to 6 months after vaccination.

Approximately 1.63 per cent of 200,000 chicks vaccinated with commercial live virus vaccines at 4 to 10 weeks of age died in the two week period following vaccination.

On the basis of carefully controlled experiments involving more than 40,000 chickens and turkeys, Beach (1949) reports a maximum death loss in young chickens of 2.6 per cent from vaccination of young chickens. Laying pullets suffered severe depression of egg production and one vaccinated flock suffered 8 per cent mortality.

The problem of immunizing susceptible day old chicks is very perplexing since these are likely to be present in hatcheries in an unknown mixture with passively immune chicks. Some advocate use of killed virus vaccines with day olds but some workers argue that this practice may interfere with later immunization of the flock with live virus vaccine.

REFERENCES


REPORT OF THE COMMITTEE ON PUBLIC RELATIONS
R. W. SMITH, Concord, New Hampshire, Chairman; H. G. GEYER, Columbus, Ohio; CHARLES HUGHES, Des Moines, Iowa; WM. KNOX, Fort Atkinson, Wisconsin

DR. SMITH: As you know, last year was the first year the Committee on Public Relations functioned. With the help of the other members in Denver, we felt that we did a fair job in getting out the highlights of the meeting to the press and when we came here this year, Dr. Geyer, our genial host, was added to the Committee.

I will say that through his efforts and his staff and the cooperation of our Secretary, as many of the papers as the Secretary had in advance were gone over even before I arrived here this week by Dr. Geyer and his staff. Excerpts of importance were made and reprinted and placed on a table in the lobby outside where some eight or ten papers, including the United Press, the Associated Press, and all papers who sent representatives here could pick them up, go through them, and use whatever they saw fit.

They have used many of them. Some papers have used more than others. At least they have taken them away with them, and I am assuming that quite a lot of favorable information and publicity has gone out to the press from this meeting.

I also understand that through arrangements made by Dr. Geyer and Mr. Knox, that there have been four or five radio transcriptions made during the week informing the public in general what we are doing here and what is going on.

The Committee on Public Relations, of course, can cover a wide field, we have made a good start. We hope in the future to branch out a little more efficiently and let the people on the outside know what this convention is all about and what we are trying to do.

I can't say too much for the wonderful assistance and help of our host, Dr. Geyer. I believe that comes under public relations as well. He invited us here a year ago, and we accepted. I have been attending these conventions now for nearly thirty years, to say nothing of other conventions that I had to attend during the course of the years. I know of no city that I have visited where the host has put more work, more constructive work, and has attended to the needs of the different committees, has been on the job, and has helped us as much as Dr. Geyer has.

I haven't been too busy this week, as you know, on the programs, thank God, and I have had an opportunity to watch and check and look around. When we wanted some printing done here, it was done and back in a couple of hours, for our use. That has never happened before.

I think it is entirely proper, and this is the place to do it, and I hope that you will all stand up at this time and give Dr. Geyer, our host, a rising vote of thanks and appreciation for his excellent work.

... The members arose and applauded...

He is a grand fellow and he has done us a grand job.

I don't know that I can say any more for the report of the Committee on Public Relations. The members, the speaker, Dr. Geyer, Charles Hughes of Des Moines, Iowa, and William Knox of Fort Atkinson, Wisconsin.
At the present time, of course, there isn't a great deal that we can do until we get here. If any of you members have any suggestion whereby we can improve the service of this all-important committee, make it more serviceable to the Association, we will consider it and cooperate, if possible, and if we are not on the Committee another year, we will pass on your remarks to those who are in charge.

Our Secretary has passed me this note, and this year it has proved his policy. I questioned a year or so ago why he wanted the copies of our papers in so early. If he hadn't had them in early this year, we wouldn't have been able to get the abstracts out to the press.

He says here that if you will send in two copies of your address at least six weeks before the meeting to our Secretary, that will enable him to send the copies on to the Public Relations Committee before we arrive. This year it gave Dr. Geyer an opportunity, as he was the man on the job here—and I believe in appointing that Committee next year, wherever we go, that man should be on the Committee.

It gave him an opportunity to delegate the best person in his state service to go over these papers with plenty of time, not to edit them, but to take out the highlights of those papers and reprint them, and that is what was done this year—and put them on that table as you have seen out there, and when the newspaper reporter comes, he picks those abstracts up. He doesn't have to go through volumes and volumes and pick out the scare lines. We have edited it, so to speak, for the press. These abstracts are available even before the paper is presented on the floor of the convention.

We believe that from such service we get favorable publicity. I would urge that all contributors to this program in the future comply with our Secretary's request and mail to him at least six weeks before the meeting, two copies of their contributions.

This is all I have to say. I think this has been a wonderful meeting. I have, as I said before, enjoyed it from the start and I was pleased to sit down this morning at breakfast, and several were around me who were not vitally connected with this Organization, but have been coming to it for years. They are in a position to know when they told me in no uncertain terms that they believed this was the greatest Organization of its kind on the American continent and probably in the world.

I am informed also that there are others here who have given us a great deal of help in making this meeting a success. That is the State Health Department of Ohio, especially Dr. Greenlee who has assisted us so generously in making this meeting a success. I suggest that you again arise to give Dr. Greenlee a rising vote of thanks and appreciation.

... The members arose and applauded...

Our Secretary has just informed me that he also has purchased 10,000 copies of "What Is Known About Brucellosis" which you ordered printed last year.
ORGANIZED PUBLIC HEALTH AND THE VETERINARY PROFESSION

A CHALLENGE

G. A. EDGE

From the earliest days codes and ordinances designed to safeguard the well being of peoples have incorporated specific injunctions relating to the consumption of the flesh and products of the lower forms of life. Whether under religious or civil auspices individuals have been entrusted with the carrying out of well defined duties in this respect. It was therefore inevitable during the past hundred years that veterinary science should be most actively concerned in furthering studies relating to animal-human disease problems and infections which might be transmitted to man through animal products. Policies formulated at the federal level found expression in Acts dealing with animal contagious diseases and the inspection of meats and meat products intended for export or interstate trade. The economics involved have been such that veterinary medicine has become an integral part of agriculture. The objectives of veterinary policies which were originally stated to be for the safeguarding of human health and for the protection of the livestock industry have been but vaguely appreciated and recognized by organized public health bodies during the past eighty years when the public health team as we know it to day was formed. The development of this team which had as its nucleus a triumvirate composed of the medical officer, sanitary inspector and nurse, and has been expanded to include specialists of one kind or another, has until quite recently failed to attract the attention of veterinary bodies and educators to the point of examining the possibilities of training specialists for the public health field and of extending markets for veterinary services. These statements may appear incongruous when it is realized that in these United States there are more than 500 veterinarians employed full time by departments or boards of health and that the terms of employment for many of these men are not unattractive. Yet as the facts are examined and perspective is given to the overall picture the inescapable conclusion is that as a profession we have been in poor condition and but half-hearted contenders in the race.

To illustrate some of the factors involved reference is being made to the experience in Ontario (Canada) and to some conclusions as a result of this experience. A few years ago, not more than six or seven, some of the leaders in organized public health felt that the time had come when veterinarians might be trained at the graduate level to become partners with members of the medical, dental and engineering professions in public health. This meant that considerable re-orientation of thinking would be necessary on the part of all concerned if the experiment were to be successful. This is stated since it is realized that in a number of respects duties which the veterinarian might consider within his orbit had been included in the activities of the engineer and sanitarian, or had been completely neglected. In large measure it is up to the veterinary profession itself to determine where the veterinary specialist fits in to the public health team and what his status shall be. If his duties were confined chiefly to routine inspectional work along such lines as
food control then it might be possible to develop a sizable field for veterinarians but who might have the status of a super layman. If on the other hand the public health veterinarian were to be considered as a consultant only then the demand for such specialists would be limited to comparatively few men employed at the federal and state levels. The veterinary profession in Ontario should indeed be thankful to those medical leaders who envisaged the public health veterinarian as one most capable of being trained to serve closest to the medical officer. This line of thought is reasonable when one considers how near the training and interests of the two professions parallel each other. It was not surprising therefore that the course for graduate veterinarians in public health at the School of Hygiene, University of Toronto—one of the schools recognized by the American Public Health Association—should in the beginning be identical with that prescribed for graduates in medicine. It has been my opinion that notwithstanding some obvious defects in such an arrangement that the initial policy has been beneficial to the veterinary profession. The close associations formed during the academic year resulted in a deeper appreciation of the objectives and values of the two professions. This close association has been carried over with the result that medical officers in health units are sensible to the advantages of including a trained public health veterinarian in their team. Thus it is that serious thought is now being given to including the services of a public health veterinarian on the basis of one veterinarian per 50 to 75 thousand population, depending on distribution as between rural and urban groups. Sufficient time has now elapsed to permit a more detailed examination of the requirements of a public health course for veterinarians.

First there is the realization that some modifications are necessary at the undergraduate level so that not only those who may enter the public health field but all graduates in veterinary medicine may have a wider appreciation of animal disease problems and food hygiene in relation to human health. The differentiation between scientific fact and opinions or hypotheses needs to be more clearly impressed at the undergraduate level. If because of his close association with agriculture the veterinarian is considered best suited to direct food hygiene activities in organized public health then his instruction must be maintained compatible with scientific development in a number of fields. For the undergraduate this involves an exposure to the results of advances made in such fields as chemistry in relation to the general field of sanitation. At the graduate level it has been evident that the veterinarian has materially benefitted from the time devoted to the study of epidemiology. An appreciation of the division of administrative authority at federal, state and municipal levels and as between departments of government is of as much importance to the veterinarian as to the medical officer of health. Since service to others is the prime consideration in advancing the veterinary cause in public health those veterinarians specializing in public health must be better informed and instructed regarding infections transmissible through animals and livestock products, and their control than any other individual engaged in the public health field. By this I am not referring only to those conditions presently dealt with under Federal Acts but also to that more nebulous group of infections in which animals may act as host or where animal products such as milk and meat may serve as the vehicles in transmitting infections. This actually brings us to the cross roads in our consideration of where
veterinary interests lie in the public health field. It is possible that some, having considered the question, would regard the veterinary sphere of influence to be restricted to that fairly well defined group of contagious diseases of animals directly transmissible to man and to routine inspectional work relating to meat, milk and poultry products. Such activities are essentially regulatory and while appreciating the necessity for control measures we must bear in mind that the trend in organized public health has been from regulation to education. Year by year the North American public is being made more and more sanitation conscious. This is more particularly the case with respect to food products, their manufacture, distribution and sale. Veterinary Public Health would be most unwise not to be in the vanguard in food sanitation developments as well as food control.

As in other jurisdictions, we in Canada have faced a shortage of trained public health personnel. Through a system of Dominion health grants monies are now available for the training of selected applicants among graduates in medicine, dentistry, engineering, veterinary science, nursing and nutrition. In the case of the first four mentioned the bursaries of fellowships are valued at $250.00 per month with tuition paid and a small allowance to cover books and travel, or a total value of $2800.00 for the academic year. An understanding is arrived at with successful applicants that they will serve in the public health field in the Province for a period of not less than two years upon completion of the course, provided that suitable employment is available. In determining the suitability of applicants not only the undergraduate record is considered but also the personality and ability to deal with the public. Although it is considered advisable that those entering the public health field should have at least two years experience of one kind or another following completion of the undergraduate course, it has been found necessary to date to accept recent graduates. An endeavour has been made, with success, to have veterinarians employed by municipal boards of health take leave of absence to attend the public health course. In such cases the municipality has assisted the employee in the matter of salary by making an adjustment between the rate of the bursary and his regular salary. As a result there are twelve veterinarians now taking the course in public health at the University of Toronto. I may say that the Dominion Department of Agriculture has been most generous in providing temporary employment for recent graduates prior to entering the public health course. At the academic level only those applicants having an undergraduate record of second class honours or better are given consideration, except for those who have been engaged in public health duties in a municipality.

The course as presently constituted consists of lectures and laboratory exercises in the following subjects—sanitation, food hygiene, public health administration, public health education, vital statistics, epidemiology, nutrition, chemistry, bacteriology, immunology, virus diseases, parasitology and industrial hygiene. Although it is realized that this course is not ideal for veterinary graduates yet it has provided a solid structure which can be adapted to the needs of the veterinarian. The inclusion of a veterinarian on the teaching staff is indeed a forward step and is one capable of enlargement. Obviously the help and advice of veterinary educators is essential for successful development. Supervised field training is also given candidates in public health. Much of the planning for the placement of veterinary public
health graduates must fall on the shoulders of veterinary administrators. Graduates may be placed in one of the following three categories—field or health unit, research or administration at the State or Provincial level. A word with respect to so called health units—these are composed of counties or a number of municipalities having populations ranging from 30 to 100 thousand. Personnel is arranged on the basis of one medical officer per 25 to 30 thousand population, one sanitary inspector per 15 to 20 thousand population and one nurse per 5 thousand population. Auxiliary services such as public health dentist, engineer or veterinarian are now being worked out as experience dictates. As previously stated present ideas indicate that it is feasible to utilize one veterinarian per 50 to 75 thousand population. Were such a principle accepted for instance, in a country having a population in excess of 140 millions the ultimate total of public health veterinarians might well approximate two thousand. This is a far cry from the present total of five hundredfull time veterinarians in public health. It is clear that considerable long range planning on the part of veterinary leaders is imperative. Veterinary schools, formerly short in numbers, are being increased and a more competitive era in veterinary medicine has begun. The field of public health offers possibilities to the veterinary profession, which, should we in the next decade fail to explore and develop, our successors for many years to come will attribute to our lack of foresight and action. It is true that the sanitary engineer and sanitarian have performed duties in public health which properly belong to the veterinarian. No irreparable damage to our cause has been done and it is frankly admitted that as veterinarians become available in the public health field some re-allocation of duties may be necessary in certain instances. Should we as a profession give voice to our aspirations in public health and take active steps to participate on a national scale in this development of health endeavours, then that recognition of veterinary science as a distinct entity in the public health team would inevitably follow.

It would be most inappropriate at this time to express with any degree of finality the specific duties of the public health veterinarian in any given community since circumstances and problems peculiar to an area will determine the ultimate possible usefulness of the individual. However, the principles which should govern the overall policy should be predicated on the following. Animal diseases communicable to man are of human health significance as well as of animal health and economic importance and data relating to the incidence of such diseases whether coming within the provisions of Federal or State Acts with respect to eradication or quarantine, may be considered as proper bases for study and action in the public health interest. In this the public health veterinarian may play at the least a liaison role. Another consideration is based on the known fact that there are wide gaps between the control of food products at the federal level and the degree of supervision and standards established at the municipal level, particularly in rural areas. The services of the public health veterinarian in formulating policies in this wide field and in providing expert supervision are of paramount importance. Although included in the preceding class, milk and dairy products comprise a field especially suited to the training and interests of the veterinarian. Finally, the role of the veterinarian
in the realm of public health education can be developed to a point equal to that of other members in the team.

In conclusion, I realize that more has been left unsaid than has been said and that many possible recommendations as to the course of action have not been set down. Differences of opinion with regard to phases in any development program may be inevitable, yet it were better to stumble forward with high hopes of the ultimate goal than ignominiously turn our backs and refuse the challenge.
The food supply of a nation determines in large part the health, happiness and economic standard of its inhabitants. Meat and milk, and products made thereof, constitute a large part of the diet of the American people. The varied educational and vocational training and experience of the average citizen of the country is such that they rely upon the guidance and judgment of the livestock sanitary officials and Health Department employees for the safeguarding of their food supplies of animal origin at a cost that is within their means. On this account uniformity and practicability of legislation and performance in meat and milk inspection is evident if everyone concerned is to merit the confidence of the consumer, the processor and the producer. Today we know even better than did this Committee in 1947 when they reported, "The science of meat and milk hygiene has been developed to a stage where, if applied effectively to the processes in the preparation and distribution of meat and milk, will assure to the consuming public a clean and wholesome supply of these products."

The Federal service assures the wholesomeness of meat and meat products for interstate shipment. Naturally those who use such products within the state of origin also receive the benefits of meat inspection, but there are countless plants in the United States that produce meat for use within the state without the benefit of inspection. Many of the frozen food locker plants that slaughter meat animals for their patrons come in this class. Cities or counties often set the standard in their area but so often that inspection may not be entirely acceptable to other communities when the meat is moved for sale and ultimate consumption; there is no need for such a situation to exist within a state.

Local conditions and States Rights must be given due consideration in setting up a state-wide meat inspection law. This can be done if the necessary effort is expended. In this regard your attention is called to the Michigan Milk Ordinance which was developed in 1942 by representatives of the following Michigan organizations: Milk Producers Association, Milk Dealers Association, the State College, Department of Health, Department of Agriculture, the State Association of Dairy and Milk Inspectors and the Allied Dairy Association. The ordinance is recommended for adoption by the individual communities in order to encourage a greater uniformity of milk-control practice in the State of Michigan. This is an example of cooperation in working toward a common goal. That common goal should be to prevent the sale of diseased and unwholesome meat and milk and products made thereof. This responsibility rests with the Livestock Sanitary and Public Health officials while the benefits derived therefrom extend to everyone.

To determine the present status of meat inspection your committee circulated a
questionnaire among these officials in the United States. Forty-two were returned with the information desired and the Committee wishes to thank them for this cooperation. The questions were:

1. Do you have a "state-wide" meat inspection law? Are you contemplating one in the near future?
2. If your state has such a law, indicate its provisions and the organization of the inspection service. A copy of the law would be appreciated.
3. Which division of state government supervises the service? Who is eligible for employment?
4. Do the funds for maintaining the meat inspection service come from the industry or from general taxation?
5. What interests or agency initiated action for such a law in your state?
6. Indicate any direct and indirect benefits from the law that have been observed.
7. If your state does not have such a law at this time, is there a great deal of public sentiment for one?

It was gratifying to note that the following five states reported each having a mandatory meat inspection law: California, Connecticut, Kansas, Massachusetts and Washington. The organization of the inspection service varies slightly from one state to the other. In Kansas and Massachusetts the State Board of Health and the Department of Public Health, respectively, supervise the law while in California and Washington this is done by the Department of Agriculture and in Connecticut it is the Department of Farm and Markets. Graduate veterinarians are in charge of the inspection service and are assisted by lay inspectors in each state except in Washington where only veterinary inspectors are employed.

California began its mandatory meat inspection in 1931 and now has 271 meat plants under state inspection. All employees are under Civil Service. They have seven supervising veterinary inspectors, 65 veterinary inspectors and 35 lay assistants in the meat inspection service.

Funds for the operation of the service come from the industry in Kansas and Washington and from the general fund by appropriation in California, Connecticut and Massachusetts.

It is of interest to note that the following agencies or groups were active in getting the above state meat inspection laws: Board of Health or Department of Agriculture, the meat industry, cattlemen's association and/or service clubs. Education of the public to the value of meat inspection and to the conditions as they existed were forerunners to the enactment of the law.

Five direct and indirect benefits have been reported by the Livestock Sanitary officials as resulting from the operation of their State meat inspection laws; they are:

1. A wholesome and disease-free meat supply for the public.
2. Reports of contagious disease to the control officials.
3. A better regulated market for the producer.
4. The elimination of unorthodox competition for the slaughterer.
5. The discouragement of cattle theft or a check on stolen animals.
The officials in the states now having meat inspection laws will be glad to counsel with anyone considering the enactment of such a law. This spirit of cooperation is appreciated and the committee is sure that it will be utilized.

Although the rest of the states do not now have mandatory meat inspection laws, a number do license slaughter houses. The states of Arizona, Colorado, Idaho, Nebraska, New Jersey and Oregon have laws for the licensing of slaughter houses with provisions so that the licensed slaughter house may request that the state meat inspection service be instituted. Maine has a slaughter house inspection and license law but no provision for meat inspection. Pennsylvania has a licensing law; the veterinary inspectors in six meat hygiene districts inspect and license abattoirs and may do some spot meat inspection if conditions warrant it—cities and boroughs may receive inspection of meat sold in their boundaries. The Montana Livestock Sanitary Board has the power to install an adequate meat inspection system. It is voluntary and limited in its operation at the present time. In North Carolina any processor may apply for a permit to operate but there is no state meat inspection service.

In Florida meat inspection is voluntary if the product is used locally but inspection is necessary for intrastate transportation.

It appears likely that a meat inspection law will be considered in the near future in Iowa, North Dakota, New York, Virginia, West Virginia and Wyoming. Such legislation either is now under consideration or was considered recently but died in legislative committee or was defeated in the legislature in Michigan, Minnesota, Missouri, Tennessee and Utah.

Although a state-wide meat inspection law may be desired the following states reporting have no such law nor is one contemplated in the foreseeable future: Alabama, Delaware, Indiana, Louisiana, Mississippi, New Hampshire, New Mexico, Nevada, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Vermont and Wisconsin. Individual cities in these states have their own meat inspection ordinances and regulations. Under the present laws, in many instances, an agency of the state is already checking the slaughter house for sanitary conditions. It would appear as if some progress is being made toward getting all meat inspected that is offered for public sale.

In conclusion the Committee wishes to call attention to two important factors to consider in a state-wide meat inspection service; they are:

1. Adequate laws or regulations to get the job done in the proper manner. The law should render the desirable and necessary public health protection and its operation should be financed in a manner commensurate with the benefits derived.

2. The availability of veterinary personnel. The change in the economics of veterinary practice that has appeared in some parts of the country together with the added number of new graduates will help to ease the personnel problem. An efficient and well-organized program will attract the personnel necessary to render the service required.
LIVESTOCK AUCTION FROM OPERATOR'S STANDPOINT

S. C. SPRUNGER

Kidron, Ohio

I am honored to have this opportunity of speaking to you today from actual experiences encountered as a former President of the Auction Sales Association of Ohio, Inc., now affiliated with the Independent Livestock Marketing Association, as a Director of this Association, as Secretary of the Auctioneers Association of Ohio from 1942 until 1948, as an Instructor since 1930 in Repperts Auction School, Decatur, Indiana, and as Owner, Manager, and Auctioneer of the oldest established Livestock Auction Market of Ohio, known as, “The Kidron Auction”.

HISTORY OF AUCTION MARKETS

The history of the Livestock Auction Markets of Ohio goes back to 1917, when a group of ten men, seven farmers and three business men, of Swiss descent, of Kidron, Ohio, formed an organization originally known as a Community Sale, patterned after the Market Days of Switzerland, where anything produced was brought together at a designated place and sold, some privately, but mostly by auction. Later they graduated from the Community Sale era, to what is nationally known today, and accepted as, Livestock Auction Markets. Your speaker today worked as a barn hand for the original organization, which conducted auctions generally from October until April, dropping out during the summer months, however, in November 1923, your speaker, a mere farm youth, saw the possibility of at least making a livelihood, purchased title to the business, little did he or even his most optimistic supporters realize that he had actually struck pay dirt. From 1923 until 1932 much pioneering was done, the first three years one sale was held each month, the next three years two sales were held each month, and in 1930 we started our weekly sales. On June 16, 1932, L. L. Rummell, then Associate Editor of the Ohio Farmer, now Dean of Agriculture at Ohio State University, attended our sale through an invitation given him by our State Representative, C. H. Swan, he was so impressed by the service we were rendering that he wrote an article covering one half page, with a full page and pictures later. Thus the Auction Markets were born, and almost immediately were established throughout Ohio, then the Mid-West, later in the East, South, and West. Today there are eighty such markets in Ohio, over five thousand throughout these United States.

Naturally this has brought some problems such as sanitation, disease control, financial responsibilities, and movement of livestock. These markets were established with the thought in mind of providing a better market for our farmers, not as a mecca for dealers who care nothing about the legality of their transactions, however, we have many dealers that are an asset to the livestock industry. We definitely need them as a stabilizing factor in our market. Some markets, as they are operated, today are a disgrace to the livestock industry, but why condemn a legitimate market on account of a small minority. Prior to 1917 and thereafter until
these markets were fully established, we would bring our livestock to Kidron on
Saturday, ship by rail to Pittsburg and Buffalo, it would arrive at its destination on
Monday, the loss especially in hogs was heavy in the summer months. In contrast
today we have packer buyers come here to purchase their requirements, and with
trucks as transportation and the independent packing plants as their final destina-
tion, our livestock is marketed much more humanely, with less loss, a higher net
return to farmers, and a superior product more economically for the consumer.

We realize that one not acquainted with the magnitude of the farm and livestock
auction business cannot begin to grasp the scope and importance of the business.
No auctioneer, or any livestock auction market has any desire to sell unhealthy
livestock.

As Secretary of the Auctioneers Association of Ohio, I want to have included in
your records the action taken by this Association, where we opposed by a strong
unanimous vote at our annual meeting in June 1947, whereas any person or persons
that advertised and sold at auction any livestock or merchandise under fictitious
names, whereas any person or persons continuously misrepresenting the offering,
whereas any person or persons selling livestock as registered without furnishing
registration papers, and whereas, any person or persons advertised and sold cattle
that were Bangs tested, but that were not under state supervision.

There is no method of selling equal to the auction method where bidding is open
and competitive, and the auctioneer who sells on a livestock market definitely is
selling on one of the most important markets in the world. It is the thought of the
National Livestock Auction Association that a committee should be appointed to
work out a cooperative sanitary and educational program, dealing with livestock
handled through auction markets, so as to inform the farmer, livestock producer,
dealer, buyer, and seller, of the great importance of disease control. A proper pro-
gram would be effective and would bring the desired results. Well organized and
well staffed livestock auction markets are essential under existing conditions. More
livestock is being sold each year by this method, and until such time as some other
system of marketing has proven its superiority we shall enjoy this enviable posi-
tion. We believe there should be a closer cooperation between the operators of auc-
tion markets and the “United States Livestock Sanitary Association”, united we
will win, divided we may fail. Every market operator should make an analysis of
his own establishment and make his improvements accordingly. We, the operators
should have enough self respect to keep our auction barns clean and above reproach.
The auction markets are the greatest farm relief ever devised, and without special
taxation or subsidies.

The manner in which the general public has accepted this somewhat new pro-
cedure in marketing has convinced me there was a definite need, gives me assurance
by their approval, that they are here to stay and will become even much stronger
provided we have adequate regulations that are simple but enforceable. These
markets are yet on trial, we have never experienced or weathered an epidemic such
as the foot and mouth disease of 1915, and very few markets have weathered a
major depression such as we had in the early '30s. Lets put our house in order.

With your permission I would like to draw a few illustrations and make some
recommendations. We might analyze them from the position of an operator who
firmly believes that livestock marketing is a legitimate and honorable profession. Most certainly a large majority of the men are not of the type that "Robert West Howard", describes in his article entitled "Ghost Meat", in the 1940 August issue of the Farm Journal and Farmers Wife. I challenge Mr. Howard to a debate on that article. My father was a veterinarian, my brother is a veterinarian, and I have been associated with farming, breeding, fattening, and marketing livestock all of my life. We have always had livestock diseases and problems and we shall always have them. Proof of my statement is in the very fact that you men are holding your 53rd Annual Convention. In plain words you organized over twenty years before there were any auction markets, why?, because you had livestock diseases and problems to combat then.

My school of thought in regard to livestock markets as being disease dispersing is somewhat different from that of many people, especially those people who live in communities where markets operate without any sanitary regulations or inspection. I do not deny that there is not some danger. History bears out the fact that where large numbers of livestock are assembled there is always that possibility regardless of how careful we might be. None of us are immune to this possibility, however, I do believe that the spreading of disease can be kept at a minimum. I firmly believe that contagious and infectious diseases can be far better controlled by properly regulated markets, than to have this same amount of livestock go through dealers hands uncontrolled. We need only to refer you to the tuberculosis situation and the hog cholera outbreaks before livestock markets were established. From 1917 until 1935 when the original Whitney Bill was enacted, and later amended, we had no controls or regulations in Ohio. Since then our situation has steadily improved, but we do not have enough men in the field to enforce our regulations. The Division of Animal Industry is definitely under-manned. Adequate funds should be provided either through proper legislation or some other method.

CHALLENGE OF OWNERSHIP

The challenge of ownership of an auction market should mean much more than to see how much money can be made quickly from its operation. We who operate markets who are looking ahead realize we cannot expect to reap dividends unless we put something back into our business structure, that is why we have promoted our Registered Livestock Program. In so doing we have returned to our patrons over $20,000.00 worth of registered livestock, mostly Hampshire hogs, to improve their herd, improve the quality of their livestock, and finally to create for them a better market. In 1945 alone this program consisted of 100 hampshire gilts and 10 hampshire boars, registered, double immune, and Bangs tested, at a total cost of $6,300.00. These all went to young farmers who had returned from the service. In our democracy the Sovereign State still allows people to own land and livestock, to do with it as they might choose. But how about our responsibility of father to son, or of one generation to another? Will we leave our marketing facilities better than we found them? When we as owners and managers of auction markets realize that good healthy livestock is one of our greatest assets, then we ourselves have taken a step in the right direction. The best insurance for continuance of family importance and stability in a rural community, is good land ownership, well estab-
lished markets, good schools, roads, and churches, and a farm stocked with healthy livestock. We are definitely challenged to do our part in strengthening rural America.

**ANALOGY OF EXISTING LAWS AND REGULATIONS**

We have banking laws to govern our banking institutions, written to serve and protect the general public. We have rules and regulations covering personal health and sanitation, regulations covering our consignments to purebred livestock auctions, our exhibits to state and county fairs, district shows and the International. Our livestock must meet these requirements or we keep them on the farm. We have milk inspection regulating the sale of milk, and unless we meet certain standards we do not sell it. The inspector simply informs us of this fact and we comply. We have hunting and fishing laws and we purchase a license for both or we do not go hunting or fishing, then we have a game protector for each county, and if someone is caught with an extra squirrel, rabbit, or pheasant, he pays or his equipment is confiscated. Might I ask this question, "Which is more important a game warden or a supervisor of livestock?" Then we have here in Ohio, and no doubt other states have the same situation, approximately 350 men in our State Highway Patrol, about four for each county, plus a sheriff and his deputies, making an average of about eight men for each county, to enforce driving regulations and other laws. In extreme cases the driving rights are taken away from some people. Yet we who operate eighty livestock markets in Ohio do not even have a full time Field Supervisor. My one recommendation is that we have a Field Supervisor who will work and cooperate with all of the markets within a state, enforcing uniform regulations, and where necessary more than one Field Supervisor be appointed.

**FINANCIAL RESPONSIBILITY**

We have entrusted to us millions of dollars worth of livestock each month, every market should be required to give sufficient bond to cover all transactions and guarantee payment to our consignors. Packer buyers, order buyers, and dealers should be likewise bonded to guarantee payment to auction markets. Some operators today are extending entirely too much credit to buyers that are not sound financially. There is much more to operating a market than just getting the livestock sold. One of the most important features of operating a market as in any other business, is keeping losses at a minimum. Sell for cash only, extend credit to buyers whom you definitely know are sound financially. Take checks only after proper identification, and if for large amounts, get an O.K. from the buyers bank before the release of livestock. We prefer to take a small loss on any purchase that is retained rather than lose the entire amount due to a check issued with insufficient funds.

**A MODEL LAW**

Another recommendation I should like to make to this group is that a committee be appointed to make a study in regard to a model law to cover all livestock markets in the United States and Canada, with the thought in mind of having all auction
markets within a state come under the same regulations to eliminate discrimination. This should not be too difficult as we are primarily concerned with the movement and disease of hogs, cattle, and sheep. We do not need any complicated laws. What we need and desire are laws and regulations that are simple, understandable, workable, and above all enforceable. Laws and regulations that have a penalty for violators and continued violations. Also incorporated in such laws or regulations would be a suggestion that livestock moving back to the farm be segregated from the regular market stock going for slaughter. And that livestock going back to the farm should have a health certificate accompany it. This would eliminate much doubt and strengthen our markets. Furthermore, I think every market should be completely cemented so they can be thoroughly cleaned and disinfected, eliminating harboring places for germs. Still another recommendation I should like to make, would it not be possible to work out some uniformity in regulations such as your board is working on at the present time in the control of brucellosis, in the movement of livestock from one state to another.

CERTIFICATE OF INSPECTION

The final recommendation is one that is highly practical, where the Field Supervisor would make an annual or semi-annual inspection of all markets under his jurisdiction, this would be very simple but all important and a step forward in the control of contagious diseases. Then have the Field Supervisor issue a certificate of inspection covering the following: construction of buildings, pens, chutes and alley ways, construction and size of the auction ring, adequate water supply, drainage, both sewer and surface, cleanliness of the market, method of cleaning, disinfection and white washing, the method used in keeping records of livestock, weights, prices, their origination and destination, provisions for light and ventilation, disposition of litter, and the general management of the market. Then set a minimum rating to cover both established and new markets, and give any market that does not meet the minimum requirements sufficient time to comply with said regulations, or have their license revoked until such time that they meet said minimum requirements. I am not in favor of closing any market as long as they operate legitimately and meet the standard set up by your Organization. Most certainly I would like to see many of them put in a more presentable condition.

FINALE

Our market was established for the sole purpose of rendering a service to agriculture. Monetary returns have definitely been secondary. In the 26 years we have operated we have always had this thought uppermost in mind. It shall always be that way. I am indeed happy to have had this opportunity, from meetings such as this where we have mutual problems we can all derive much good, have a better understanding and a broader knowledge of each others work. Naturally I am happy to know that our certificate of inspection has a rating of 98%, and penciled across the bottom by the inspector, Dr. Allen E. Fogle, is this, and I quote, "A market Ohio can be proud of". My employees, to whom I am deeply indebted for the success of our market, together with my efforts, shall endeavor to reach that mark of
perfection. Truly this has been hard work but we have enjoyed it, anything worthwhile is worth working for, you are here for a purpose, there must be a reason why I am here. Together we shall go forward with our work. We represent the final transaction of a great investment. Our field is large and we have entrusted to us the opportunity of rendering a real service to the greatest of all industries, Agriculture.
REPORT OF THE SPECIAL COMMITTEE ON COMMUNITY AUCTION SALES

GEORGE RATHMAN, Topeka, Kansas, Chairman; A. E. Fogle, Columbus, Ohio; J. T. Schwall, Madison, Wisconsin; R. S. Sugg, Auburn, Alabama; Ralph West, St. Paul, Minnesota.

Committees on community auction sales have given us, in the past, the advantages and disadvantages of community sales, and I am sure that all of us are familiar with the various reports and understand that something must be done to control disease in livestock which are sold through these sales.

This committee has broadened out the report which was submitted to the Association in 1948. We are presenting herewith the substance of a community sale law which may be changed to meet requirements of the various states.

In order to have proper cooperation, we believe the community sale operators should have state organizations, and should affiliate with the national organization. They should also become members of the U. S. Livestock Sanitary Association so they may become familiar with the problems of the livestock sanitary officials.

We believe the majority of the managers of these sales are as interested as the sanitary officials in controlling livestock diseases. Of course, there are a few exceptions, but we believe that operators who do not comply with the sale laws and regulations could be restrained through cooperation between the sale operators and the livestock sanitary officials of the state.

One thing is certain, we cannot reach an agreement if the problems which are presented to the sanitary officials are not solved through discussion with representatives of the sale organizations. If the sale operator will agree with the livestock sanitary officials on the importance of disease control and will assist in the formulation of laws and regulations governing the operation of community sales, many of the problems in connection with disease control at community auction markets will be solved.

Each state has its own designation for its chief livestock sanitary official. In some states he is called the "state veterinarian", in others, "chief of the bureau of animal industry." As a matter of convenience, in the law which we are submitting we refer to the administrative officer as the "commissioner". The proposed law is as follows:

COMMUNITY SALE LAW

1. Definitions. As used in this act, except where the context clearly indicates a different meaning: (a) The term "commissioner" means the livestock sanitary official of the state. (b) The term "livestock" means and includes cattle, swine, sheep, goats, horses, mules, and poultry. (c) The term "person" means and includes any individual, partnership, corporation or association. (d) The term "producer" means any person engaged in the business of breeding, grazing or feeding livestock. (e) "Consignor" means and includes any person who ships or delivers to any dealers, as hereinafter defined, livestock or other property for handling, sale or resale at a community sale, as hereinafter defined. (f) The term "community sale" means any
series of sales, exchanges or purchases of any livestock made at regular or irregular intervals at an established place or places in the state, and held more than three times a year, by any person, directly or indirectly, for or on account of the producer or producers, consignor or consignors thereof, at public auction or at private sale thereat that this term shall not apply to sales, purchases or exchanges of livestock of any person, persons or corporation selling the products or produce belonging to them in interstate commerce, when made at or upon a public livestock market which is subject to regulation under what is commonly known as the packers and stockyards act of 1921 of the United States and where federal veterinary inspection is regularly maintained under the supervision of the Bureau of Animal Industry of the Department of Agriculture of the United States of America. (g) The term “dealer” means any person who, in the state, shall receive on consignment, or solicit from the producer or consignor thereof, or hold in trust or custody for another, any livestock for sale or exchange, on behalf of such producer or consignor at a community sale, or shall sell, purchase or exchange, or offer for sale, purchase or exchange, at a community sale, for the account of the producer or consignor thereof, any livestock or shall directly or indirectly own, conduct or operate a community sale: Provided, the term “dealer” shall not be construed to include any packer or agent of a packer who receives or purchases livestock for prompt slaughter. (h) The term “packer” means any person engaged in the business of buying livestock for purposes of slaughter, or of manufacturing or preparing meats or meat food products for sale or shipment, or of manufacturing or preparing livestock products for sale or shipment, or of marketing meats, meat food products, livestock products, poultry or poultry products.

1. Power to make regulations. The commissioner, whenever he may deem it necessary, may promulgate and announce rules and regulations under which the community sale laws shall be applied.

2. Dealer’s License; application; annual fee; bond; damage actions. It shall be unlawful for any person to act as a dealer as herein defined, without first being licensed by the commissioner. Every person acting or desiring to act as a dealer shall file an application with the commissioner for such license, and such application shall be accompanied by an application fee of two hundred dollars for each license year or fraction thereof for each place of location at which such dealer intends to conduct or operate a community sale. Such application shall in each case state the character of property the applicant proposes to handle as a dealer, and the place at which such community sale is to be held or operated by the applicant. Before any license is issued to any dealer, the applicant therefor shall execute and deliver to the commissioner a bond, executed by applicant as principal and by a solvent surety company which is licensed to do business in the state as surety. Said bond shall be for the term expiring at the end of the fiscal year and in the amount of five thousand dollars. Said bond shall be conditioned upon compliance by the principal with the provisions of this act and upon the prompt, faithful and honest handling by the principal of such livestock in accordance with the terms and provisions of this act and the prompt remittance of the proceeds from the sale, purchase or exchange thereof to the lawful owner of such livestock. Said bond shall be to the state for the use and benefit of such person or persons as may suffer loss or damage
by breach of the condition thereof. Any producer, consignor or purchaser of livestock claiming to be injured by the breach of any dealer of any of the terms and provisions of said bond may bring action thereon to recover the damages caused by such breach. When said bond has been approved by the commissioner, and the application fee of $200.00 has been paid, and the applicant's sale premises have been inspected by proper authorities and the inspector has found that all facilities used for handling, penning or loading livestock are constructed in a manner that will prevent danger or physical injury to livestock; that quarantine pens have been constructed; that all floors and pens in which hogs are held and alleyways in which hogs are moved, also, floors and pens for holding small calves, are constructed of concrete or some other impervious material which can be cleaned, washed, drained and disinfected; that cattle pens are so constructed and of such material as to permit proper drainage, the commissioner thereupon shall issue to such applicant a license entitling the applicant, to conduct the business described in the application at the place named therein for a period expiring at the end of the fiscal year following the date of issuance, or until such license shall have been revoked for cause.

3. Release of surety on bond; notice to principal. Any surety on a Bond furnished by any community sale dealer, or applicant for community sale dealer's license, shall be released and discharged from any and all liability under said bond accruing on such bond after the expiration of sixty days from the date upon which such surety shall have filed with the commissioner a written request to be released and discharged, but this provision shall not operate to relieve, release, or discharge the surety from any liability already accrued or which shall accrue before the expiration of the sixty-day period. The commissioner, upon receipt of such request, shall promptly notify the principal who furnished the bond and unless the principal shall on or before the expiration of the sixty-day period file with the commissioner a new bond fully complying with the provisions of this act, the commissioner shall forthwith revoke and cancel such community sale dealer's license and notify such dealer.

4. Complaints; investigations and hearings; arrests. For the purposes of enforcing the provisions of this act, the commissioner is authorized to receive verified complaints from a producer or producers, consignor or consignors against any dealer, or any person assuming or attempting to act as such, and upon receipt thereof, or on his own motion, said commissioner shall have full authority to make any and all necessary investigations, and to hold hearings in connection with the administration of any of the provisions of this act, and relative to such complaint or any violation or alleged violation of the act. The commissioner and his authorized representative shall have power to make investigations and arrest any persons found violating this act and shall have, at all reasonable times, free and uninterrupted access to any and all buildings, yards, pens, chutes, or scales in or upon which any of such livestock may be kept, quartered, weighed or handled by any dealer.

5. Same: suspension or revocation of license. The commissioner, on his own motion, or upon the verified complaint of any interested party, may investigate, examine or inspect any transaction or happening which may involve a violation or alleged violation of this act or any rule, order or regulation lawfully issued and promulgated
by the commissioner thereunder. In the furtherance of any such examination, investigation or inspection, the commissioner or any authorized representative thereof may examine that part of the ledgers, books, accounts, memoranda or other documents, scales, measures, livestock and other articles and things used in connection with the business of such person relating to the transactions involved. The commissioner or his duly authorized representatives shall hear the parties to such complaint and after the conclusion of any hearing, the commissioner shall enter a decision, either dismissing such complaint or specifying the facts established on such hearing, and shall give notice thereof to the interested parties. If, upon such hearing, the commissioner determines from the facts specified that the licensee has violated any provisions of this act, he shall, unless the offender has already made reparation to the person offended, suspend or revoke the license of the licensee. Nothing in this section contained may be construed as limiting the power of the commissioner to revoke or suspend a license when he is satisfied of the violation of the provisions of Article 6 of this Act.

6. Grounds for refusal, revocation or suspension of license. The commissioner may, after hearing as provided in articles 4 and 5 of this act, refuse to grant a license and may revoke or suspend any license, as the case may require, when he is satisfied of the existence of any of the following facts: (a) That any provisions of this act, or any rule, order or regulation lawfully promulgated thereunder by the commissioner has been violated by the applicant or licensee. (b) That the applicant or licensee has knowingly received on consignment or sold at a community sale any stolen livestock, or mortgaged livestock without authority of the lawful owner or mortgagee. (c) That the licensee was guilty of fraud or deception in the procurement of such license. (d) That the applicant or licensee has violated the laws of the state, or official regulations governing the interstate or intrastate movement, shipment or transportation of any livestock. (e) That the applicant or licensee fails to practice measures of sanitation, disinfection and inspection, as included in this act or as prescribed by the commissioner, of premises used for yarding, stabling, housing, or holding of livestock. (f) That there has been failure to keep records required by the commissioner or a refusal on the part of the licensee to produce records of transactions in the carrying on of the business for which such license is granted, or that the licensee selling livestock by weight fails or refuses to have livestock handled by him weighed on scales that are regularly inspected and tested for accuracy by duly authorized public authority or authorities.

7. Appeals; notice: Any decision, order or ruling made by the commissioner may be appealed from by the person or persons against whom said order, decision or ruling is made, by giving written notice of his intention to appeal within fifteen days from the date said order was entered, by service of a notice upon the commissioner, personally, or by registered mail. Upon the service of said notice, the commissioner shall forward all papers, files, and proceedings had in said hearing to the clerk of the district court of the county wherein the aggrieved person resides, and said appeal shall be docketed as appeals of civil actions and shall be tried as such.

8. Inspectors, appointment. The commissioner shall appoint from time to time such inspectors and such other persons as in his judgment may be necessary to properly administer the provisions of this act.
9. Inspection by authorized veterinarian; treatment when necessary; certificate to purchaser; fees. All livestock consigned and delivered on the premises of any licensed livestock community sale shall, before being offered for sale, be inspected by an authorized veterinarian who shall examine or test, when necessary, each and every animal consigned to the livestock sales ring for the purpose of determining their condition of health and freedom from infectious, contagious, or communicable diseases. Such veterinarian shall be employed by the dealer and approved by the commissioner and may be employed at one or more sales when the sales do not operate on the same date. The dealer shall not discharge such veterinary inspector during the licensed year or change such veterinary inspector at the time of issuance of a new license without the approval of the commissioner, except when the dealer and the employed veterinary inspector mutually agree or such inspector resigns. All livestock sold, resold, exchanged or transferred, or offered for sale or exchange at a community sale shall be treated as may be necessary to prevent the spread of contagious or infectious diseases. A certificate of inspection, on a form to be approved by the commissioner, shall be issued to the purchaser by the inspector. A fee of three cents per head for general inspection of livestock offered for sale shall be collected by the dealer from the consignor and shall be paid to the veterinarian for the inspection of all livestock. If the charges per head collected on all livestock inspected at a community sale do not amount to $15.00 or more, the community sale dealer shall pay the veterinary inspector the amount collected from the consignor, plus such additional sum as is necessary to make up such required minimum per diem.

10. Dealer to keep books and records; report to commissioner. Each dealer shall keep such books, records, accounts and memoranda of the business transacted at each community sale conducted and operated by such dealer hereunder, as shall show, among other things, the date on which each lot of livestock was received by the dealer, together with the names of both buyers and sellers thereof, the place of origin of livestock, the make or manufacture and the state license numbers of all vehicles transporting such livestock, together with the names of drivers of such vehicles and the driver's license number and the name of the owner or consignor, signed by the owner or consignor, or their agent, to be kept on file at place of business of sale or sales for one year. Each dealer shall also make such reports to the commissioner as to the business transacted, as to the rates and charges for services rendered, as to facilities furnished by the dealer and as to such other matters and things as the commissioner may deem necessary for the effective administration of this act.

11. Fee per head at sales; disposition of monies. The dealer shall collect a fee of three cents per head on all livestock from the consignor at a community sale and remit the sum to the commissioner on the 10th day of the following month. All monies so collected shall be deposited in the state treasury and shall be known as the "livestock community sale fund" and all monies in such fund shall be and are hereby appropriated to the commissioner for the purpose of administering this act and employing any assistants necessary and shall be paid out therefor only on vouchers issued by the commissioner and upon the warrant or warrants of the state auditor. Any unexpended balance in said fund at the close of any fiscal year is hereby
reappropriated for the succeeding fiscal year. The fee per head herein provided for shall be in addition to the inspection fees stated in article 9 of this act, and in addition to the license fee payable to the commissioner for license mentioned and described in article 2: Provided. That the commissioner is hereby authorized and empowered, whenever he shall determine that the fees provided by this section and paid into the state treasury as provided by law are yielding more than is required for the purposes to which such fees are devoted by law, to reduce such fees for such period as said commissioner shall deem justified; and in the event that said commissioner, after reducing any such fees, finds that sufficient revenues are not being produced by such reduced fees, said commissioner is authorized and empowered to increase or to restore said fees to such rates as will, in his judgment, produce sufficient revenues for the purposes as provided in this section, but not exceeding those now provided.

12. Report of sales; remittance. The dealer shall, promptly following the sale or exchange of any livestock consigned or delivered to him, transmit or deliver to the producer or consignor a true report of such sales showing the amount sold and the selling price. Remittance in full of the amount realized from such sales, less the commission, if any, that the dealer is entitled to for making such sale and other proper charges, shall accompany such written report of sales.

13. Penalties for violations. Every person, firm or corporation shall be deemed guilty of misdemeanor, and upon conviction shall be punished by a fine of not less than one hundred nor more than five hundred dollars or by imprisonment in the county jail or not less than sixty days nor more than six months or by both such fine and imprisonment, who (a) assumes or attempts to act as a dealer, without a license, (b) imposes false charges for handling or services in connection with livestock handled, sold or exchanged, or offered for sale or exchange at a community sale, (c) fails to account promptly, correctly and fully for any livestock sold or handled by him and properly to make settlements therefor, as herein provided, (d) makes false or misleading statements as to market conditions at any community sale conducted or operated by him or it, (e) makes any false or misleading statements as to the health or physical condition of the livestock or quantity of livestock shipped or sold, (f) fails to comply in any respect with this act and any and all rules, regulations and orders, which the commissioner may promulgate hereunder.

14. Invalidity of part. If any clause, section, paragraph or part of this act shall, for any reason, be adjudged by a court of competent jurisdiction to be invalid, such adjudication shall not affect, impair or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph or part thereof directly involved in the controversy in which such adjudication shall have taken place.

Paragraph 9 of the proposed law provides that all livestock consigned and delivered on the premises of any licensed community sale shall be inspected for health. Possibly there are some states which do not require the inspection of animals sold for immediate slaughter. The paragraph could be changed to exclude from inspection those animals to be disposed of for slaughter purposes, which would eliminate the inspection fee.

While not actually a part of the community sale law, we believe the following
requirements should be adopted in all states that do not have livestock laws which require a permit from the livestock sanitary official in order to move diseased livestock.

1. **Penalty for bringing diseased animals into the state.** That any person who shall knowingly bring into this state any domestic animal which is affected with any contagious or infectious disease or any animal which has been exposed to any contagious or infectious disease shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than one hundred nor more than one thousand dollars.

2. **Penalty for certain unlawful acts.** That any person who shall have in his possession any domestic animal affected with any contagious or infectious disease, knowing such animal to be so affected, who shall permit such animal to run at large; or who shall keep such animal where other domestic animals, not affected with or previously exposed to such disease, may be exposed to such infectious or contagious disease, or shall sell, ship, drive, trade or give away such diseased and infected animal or animals which have been exposed to such infection or contagion, except by sale, trade, or gift to a regularly licensed disposal plant; or shall move or drive any domestic animal in violation of the rules, regulations, directions or orders establishing and regulating quarantine, shall be deemed guilty of a misdemeanor, and upon conviction shall be fined in any sum not less than one hundred nor more than five hundred dollars for each such diseased or exposed animal which he shall permit to run at large, or keep, or sell, ship, drive or trade or give away, in violation of the provisions of this act: Provided, That any owner of any domestic animal which has been affected with or exposed to any contagious or infectious disease may dispose of the same after he obtains from the commissioner a written permit to sell such animal for slaughter, or to disposal plant.

It is not the intention of this committee to give you something new on community sales. We are compiling the information we have had from previous committees which, we believe, may be used as a foundation for a community sale law in states that do not now have such a law, and which may contain suggestions useful to those states that propose to modify their community sale laws as they now exist.
REPORT OF THE COMMITTEE ON FOOT AND MOUTH DISEASE


The distribution of the various types of foot-and-mouth disease virus in the world is not known to have changed materially in the last several years, except for the occurrence of type "A" virus in Mexico. Moreover, alertness as to prevailing types of virus has somewhat increased in most countries. Europe, has, in general, been chiefly affected by Vallee types "O" and "A", while Italy, peculiarly, has experienced infections by "C" and "O". All three types have been identified at various times in several countries of South America. The viruses prevailing in parts of Africa are understood to be under special scrutiny at the present time.

It is notable, however, that vesicular stomatitis, both Indiana and New Jersey types, particularly the latter, persist in Mexico. During the past year definite diagnoses through animal inoculations have been made of New Jersey type vesicular stomatitis in Arizona, Colorado, and Texas. Clinical diagnoses of vesicular stomatitis have been made in Kansas, Minnesota, Nebraska, and Wisconsin. Apparently the disease, as well as so-called mycotic stomatitis has been widely prevalent. These occurrences serve to emphasize the importance of establishing definite diagnoses in all cases of disease even remotely resembling foot-and-mouth disease, from which the United States has been free for more than twenty years. Failure to determine exactly the cause of such outbreaks might lead in any instance to overlooking or ignoring what might eventually prove to be foot-and-mouth disease.

In its report at the 52nd Annual Meeting of the Association, this Committee reaffirmed adherence to the traditional national policy of stamping out foot-and-mouth disease if it should occur in the United States. Your Committee also emphasized the necessity of providing facilities in the United States for independent research on the disease. It is considered advisable, however, to review briefly the status of the plans of the Bureau of Animal Industry for these facilities.

Research on foot-and-mouth disease by the United States was recommended many months ago by a substantial representative committee of livestock people advisory to the Secretary of the United States Department of Agriculture. The Secretary's Advisory Committee for Research on foot-and-mouth disease made similar recommendations. Authority to establish research facilities in the United States for this purpose was granted by the national Congress in Public Law 496, which was approved April 24, 1948. Following extensive hearings and wide travel in this country and Mexico, a Special Subcommittee of the Committee on Appropriations of the United States Senate (80th Congress) made specific recommendations as to the necessity and requirements for such a laboratory. Numerous hearings on the Bureau's request for funds to activate the authority granted in Public Law 496 were held by committees of both the House and Senate early this year.
Final authority was granted in Public Law 119, (81st Congress), approved June 23, 1949, for the Bureau to prepare plans and specifications and purchase options on suitable land for the proposed installation. The law provides that the plans, when completed, as well as the proposed site shall be submitted for further consideration by the Appropriations Committees of the House and Senate. The Bureau and Public Buildings Administration are presently engaged in drawing up plans for the laboratory to be presented before the end of the fiscal year on June 30, 1950.

Your Committee considers the establishment of research facilities for foot-and-mouth disease in the United States as essential for the proper protection of the country. Additional information and facilities for the immediate detection and more ready identification of foot-and-mouth disease virus are urgently needed in this country. Methods of processing of import animal products merit further detailed research. Studies should be made of disinfection techniques and animal carriers, both of which are extremely important in relation to proper protection of our livestock industry and the most efficient control and eradication procedures.

Practically all of the vaccine used for prevention of the disease in countries where it is enzootic or where it occurs sporadically is of the Schmidt-Waldmann type. This product has been proved to be of definite value in assisting in control of the disease in many countries. The success of application is mainly dependent upon the following factors:

First—the specificity of the product in relation to prevailing types and strains of the virus;
Second—the extent and thoroughness of its use; and
Third—recognition of the relatively short duration of resistance produced by the product.

The vaccine has definite limitations other than these, such as the considerable cost and time involved in its proper preparation and testing.

The development of complement fixation and other serologic tests for the ready identification of the different immunologic types and strains of the viruses of foot-and-mouth and other vesicular diseases are being developed to an increasingly satisfactory state. There is need, however, for continued work in this field in order that improved procedures for typing may be developed.

Another outstanding and promising accomplishment in the field of research is the technique of propagation of the virus in tissue culture as developed originally by Frenkel in Holland. Progress has been made but more work remains before this technique for production of virus will be known to have practical application in the production of vaccine.

Also promising, but with considerable development necessary before its practical value can be determined, is the growth of an individual strain of foot-and-mouth disease virus in embryonated chicken eggs.

With the exception of the program in Mexico, which is treated elsewhere in this report, the most notable development with respect to foot-and-mouth disease during this past year was the extensive sweep of the disease in epizootic form throughout most of Continental Europe. Our information indicates that this outbreak began near the Spanish border of France in August or September of 1948 and from there it spread through France, Belgium, The Netherlands, Germany, Denmark, Italy,
and into Switzerland and Sweden. The extent of the disease in Eastern Europe is not known but it appears that the countries in that area did not escape.

This sweep of the disease followed a period of relative quiescence since 1942, and is typical of the resurgence following a period of quiet in the course of foot-and-mouth disease over the years.

During the same period a series of outbreaks occurred in Great Britain. However, the situation in that country was different from that existing on the continent in that the individual outbreaks were limited in extent (usually involving one farm) and relatively infrequent in occurrence. In each case the infected and exposed animals were promptly slaughtered and the premises disinfected, using the same procedures that have been followed in outbreaks that have occurred in this country. It should be added that Switzerland, using a combination of slaughter and vaccination, has kept the incidence of foot-and-mouth disease in that country to a minimum as compared with the other countries of Continental Europe, Denmark also has had good success along this line. Most of the other countries of the continent (Scandinavian countries excepted) have had such widespread outbreaks of the disease that effective control has not been possible.

It is of interest to note that a case of rinderpest occurred among zoo animals in Rome in 1949. Control measures were effective to prevent its spread although it was necessary to slaughter quite a number of the cloven-hoofed animals in the zoo.

The situation with respect to foot-and-mouth disease in the remainder of the world did not change materially during the year except that Ireland and North Ireland have remained free of the disease for several years and have this year been so listed officially. The countries in Asia, Africa (except the Union of South Africa) and most of South America continue to have recurring outbreaks of the disease. In May 1949, a severe outbreak occurred in Argentina. However, there was nothing of unusual interest about the outbreak. Vaccination is being used more and more in both South America and Europe. However, generally in South America and in some European countries vaccination is not carried out in a very systematic manner, according to information available.

The campaign to control and eradicate foot-and-mouth disease in Mexico has been pushed vigorously during the past year. Some of the highlights are:

1. At the writing of this report the disease had not broken beyond the outer quarantine lines.

2. Observable incidence of the disease within the quarantined area has been reduced to a minimum, thus indicating that the coordinated program of inspection, quarantine, slaughter, disinfection, and vaccination is effective to control and may be the means of eradication of the disease.

3. As of September 30, 1949, the Joint Commission laboratories in Mexico had produced more than 31,000,000 doses of foot-and-mouth disease vaccine. In one unusual month, it was necessary and possible to produce 5,200,000 doses.

4. On the basis of controlled experimental tests, it has been determined that the vaccine produced in Mexico, in the doses used, cannot be relied upon to maintain substantial resistance to the disease for more than four months. In the present program, animals are being revaccinated at that interval.
5. As of September 30, 1949, more than 27,500,000 vaccinations of cattle, sheep, swine, and goats, had been made. The first wave of vaccination throughout the quarantined area, involving more than 13,000,000 animals, had been completed early in August, 1949; over 10,500,000 animals had been vaccinated the second time, and more than 3,500,000 had been vaccinated the third time. As many as 3,500,000 animals had been vaccinated in one month. The production and testing of vaccine in these amounts requires the outright slaughter of 10,000 to 12,000 normal, previously unexposed cattle per month. This represents a tremendous expense which at the same time affords an important outlet for cattle surpluses in northern Mexico which cannot be exported to the United States, as was formerly possible.

6. As of September 30, 1949, there were over 1,100 Americans and 5,000 Mexican nationals employed in the campaign. This does not take into account military personnel assigned to the program.

7. The cost of the eradication work in Mexico reached 2½ million dollars per month, with the United States bearing most of the financial burden.

8. Equipment used in the campaign includes hundreds of jeeps and trucks, cars, boats, and even airplanes. The entire field forces are linked together with the headquarters at Mexico City with two-way radio. Mexico City is linked with the Bureau in Washington by teletype.

9. The Bureau continues to maintain the patrol of the entire Mexican-United States boundary to enforce the prohibition against entry into this country of cattle, sheep, swine, and goats, and fresh meat from such animals and to enforce the restrictions against importations of certain animal by-products. The patrol is partly on horseback, and partly in jeeps and by airplane. The key men along the line have been deputized as Customs agents, thus giving more authority to the patrol and assuring close cooperation with other government agencies working along the border.

10. Canned meat purchased in northern Mexico to afford a market for surplus cattle that would have come into the United States except for the embargo amounted to 137,000,000 pounds during the fiscal year ending June 30, 1949. As there was a decided drop in meat prices and in the demands for meat in foreign countries during the year, the Department absorbed a considerable loss on the canned meat purchase operations. Purchases during the coming year will undoubtedly be very much smaller in number and at a greatly reduced price.

The foot-and-mouth disease eradication campaign as now being conducted cooperatively by the United States and Mexico should have the continued full support of this Association. Everything is being done that can be done to attain the goal of final eradication of the disease in Mexico.

As further protection for the United States, it is recommended that the Association go on record as supporting the Legislation now pending in Congress for construction of an adequate fence along the western land boundary between the United States and Mexico. Such a fence would be of mutual benefit to both countries not only in the control of foot-and-mouth disease but other diseases such as tick fever and dourine as well.
REMARKS ON FOOT AND MOUTH DISEASE

S. O. FLADNESS

Assistant Chief, United States Bureau of Animal Industry, Washington, D. C.

DR. FLADNESS: I want to make a very few remarks, if I may. Something has happened to my voice. Without claiming to have said very much, I know I have talked altogether too much and either that or the climate in Columbus is unfriendly.

I believe that Dr. Wilkins' report and the showing of the film has covered the ground very completely and there isn't really much that could be added without talking altogether too long.

If we were not so far behind already on our schedule with the addition of this film to your program, and I had a little more voice, I would take great pleasure in pointing out one or two factors that we like to emphasize.

Mention was made in the report, and also pointed out in the film, that we have now gone more than twenty years without an outbreak. That involves what we call the foreign quarantine service which is the prevention service. It is an unspectacular job of work, this guarding our ports, and, since the war, also international airports. Every kind of material that comes in from a foreign port and that may possibly harbor the virus comes under control. That is the job which we think has kept us free for twenty years, notwithstanding that in the meantime, modes of transportation have multiplied and increased tremendously in speed back and forth across the world.

Being unspectacular, being the kind of work where we never have anything concrete to show, it doesn't attract much attention. If it doesn't attract attention, it also lacks support at times and it needs it very badly. We have had difficulty in the past and as these complexities of commerce increase, our difficulties and the complexity of our duties increase.

We need additional support always for that work because, as I said, we have nothing concrete to show. It is only when nothing happens over a period of years that we may presume to have been successful.

Now we think that we must have done a reasonably good job because we have stayed free for twenty years, but the years have to go by before we will know that we have accomplished anything. It is a negative service altogether. There is nothing concrete and affirmative to show and, consequently, we have a difficulty in interesting people in the proper places so that we can have personnel and funds and things of that sort adequate to cover this job which we scarcely ever have had.

I wish that you folks who represent the United States and the guardians of the industry would kindly remember that. We need friends in that service.

The only other thing which the film brought out, we hope rather forcefully, is the tremendous importance of quick discovery of any infection that may get past the barriers in this country. It is illustrated in the film.

Being one of the old-timers around the place, having been through all the out-
breaks in the United States, and having spent time in many foreign countries where the disease is prevalent, I can look back and see what a difference that makes.

As was demonstrated in the film, our outbreak in 1929 was over in 60 days because it was discovered quickly. It was not discovered quickly in 1914 and it almost got away from us. It was not discovered quickly in Mexico and there were international complications before we could get to work and there it almost got away. I say almost because it hasn’t really gotten away.

I appreciate the privilege of addressing you for a few minutes. That is all I will have to say. (Applause)
DISCUSSION

M. S. SHAHAN

Pathological Division, Bureau of Animal Industry, Washington, D. C.

I think that the highlights of the developments in research were adequately summarized in the Committee Report. However, you might be interested in a few details of the Bureau's activities with relation to research.

The Bureau has consummated cooperative agreements for the prosecution of research on foot and mouth disease with established laboratories in Holland, Denmark, and Great Britain. We have had two veterinarians working in Amsterdam, chiefly on tissue culture of the virus, and on tissue metabolism. We have had two veterinarians working in Denmark, chiefly on the composition of the vaccine, attempts to improve it, and to increase the duration of the immunity which it produces.

In England, the work is mainly devoted to serological work and physical research on the virus.

In Mexico, of course, the program is devoted essentially to the problem of control and eradication. There was little opportunity for research as such; however, the Mexican program has provided an outstanding example, on a huge scale, of field experimentation in the use of vaccines, and through the production and testing work that has been done, it has been quite clearly demonstrated that the 2 cc. dose of vaccine used in Mexico has done a very good job under the conditions.

It was very adaptable for the Mexican program chiefly because of its small dosage as compared with approximately 30 cc. of the other type.

It was adaptable, also, because it could be transported in larger amounts under conditions of refrigeration which are essential.

Secondly, it has been shown that a second or booster dose of vaccine quite materially increases the duration and degree of immunity. I think we should make some comments about the status of our present plans for facilities in the United States for research on foot and mouth disease.

This was mentioned and the details were summarized in the committee report. We are presently engaged in preparation of these plans and some time within our fiscal year which ends on June 30, we will again go to Congress seeking appropriations for the construction of this laboratory which, according to the public law, must be on an island separated from the mainland by deep navigable water.

The decision has not yet been reached as to the location of the laboratory. We hope it will be made soon as it will assist materially in the completion of our plans.
PROGRESS REPORT ON AVIANIZED ANTI-RABIES VACCINATION PROJECT


Atlanta, Georgia

All species of warm blooded animals are susceptible to rabies. Since this disease is transmitted almost entirely by tooth wounds inflicted by rabid animals, transmission is limited except in rare instances to animals in the canine and feline families. Of these animals, the dog is by far the most important in relation to rabies. It occurs periodically in epidemic form in foxes, coyotes, wolves and other wild animals but it is to a large degree self limiting in these animals and is relatively of minor importance as compared with the dog.

We have depended primarily on two methods of control of rabies, immunization and control of movement or freedom of the dog. Both have serious defects. Immunization is expensive and to date must be repeated annually. To control the disease it is necessary to immunize at least 80 per cent of the dogs. In Georgia with an estimated dog population of approximately 400,000, this is obviously an impossible undertaking, however, the veterinarians in Georgia have done an excellent job by immunizing approximately 60 per cent of the dogs annually for the past four years. Because of the expense and inconvenience to the owners it is becoming increasingly difficult to maintain this percentage.

Present immunization agents generally in use are composed of 20 per cent brain emulsion, containing fixed killed virus, these vaccines induce at best an uncertain immunity for a period of one year, more or less. They also produce not infrequently troublesome or even fatal reactions in the dog such as abscesses at the site of injection and partial or complete paralysis.

We are of the opinion that rabies can never be eradicated until an immunizing agent is available which will with one treatment, confer a solid, long lasting immunity. From a purely theoretical viewpoint such a product must contain living virus attenuated to the extent that it will not reproduce rabies, but retaining strong antigenic properties.

Certainly any product which offers reasonable assurance of superiority over those currently used should be given a thorough trial.

The development of a chick embryo propagated vaccine was reported to a group of interested parties in attendance at the 1948 meeting of the U. S. Livestock Sanitary Association at Denver, Colorado, by Dr. Cox of Lederle Laboratories. On January 5th and 6th of 1949, a meeting was held in Atlanta, Georgia, for the purpose of studying the protocols concerning this vaccine. Representatives of the U. S. Public Health Service, Rockefeller Foundation, Emory University, Georgia Department of Public Health and the Georgia Veterinary Medical Association

1 Public Health Veterinarian, Epidemiology Division, Georgia Department of Public Health; (Starr and Stafford) and Intern student, School of Veterinary Medicine, Athens, Ga. (Dye)
were represented. After a thorough study of the laboratory records and the safety and potency tests, it was decided that the product had sufficient merit to warrant a field trial involving at least 7,000 dogs. Immunization of this number of dogs would be of statistical significance in determining the safety value of the product from the viewpoint of transmission of rabies, abscess formation and post vaccinal reactions. The occurrence of abscesses and post vaccinal reactions are quite frequent sequelae of brain tissue vaccines and constitute one of the serious objections to its use on the part of dog owners.

The other factor concerning the value of any immunizing agent is the duration of the immunity induced. This field trial is planned to run for a period of years with periodic challenge of a few dogs to determine the duration of immunity in question of years. A close check will be maintained on all immunized dogs for the duration of the trial.

The project is set up in the following manner. The vaccine is furnished without charge to the State Health Department and all vaccine is administered by practicing veterinarians. All vaccinated dogs are permanently identified by a tattoo number in the ear or flank and the owner is furnished a special certificate and a bronze tag for attachment to the dog's collar. A special card is maintained in the office of the State Department of Health for each animal. This card is designed to record all information pertaining to the health of the animal during its lifetime. Each participating veterinarian is expected to report any illness or the death of any animal along with a statement as to the cause of illness or death. In addition personnel of the Health Department make personal checks at regular intervals.

Most of the dogs under one year of age have never received any previous anti-rabic vaccine. Georgia dog owners are rabies conscious and annual vaccination of good hunting dogs is a common practice, therefore, older dogs in most instances received one or more annual treatments with brain tissue vaccine. It would have been better to have selected only dogs which had never been vaccinated, but this was considered impractical. Dog owners are interested in protecting all their animals and not in the collection of statistical data.

To date 422 dogs have been immunized since May 14, 1949. Their ages vary from three months to eleven years. They are located in twelve communities in the State, some of which, notably Fulton and Crisp Counties, have been undergoing a severe rabies epidemic for several months. Most of the dogs belong to the sporting breeds; bird dogs, fox hounds, beagles and one kennel of blood hounds. These breeds of dogs were selected because they are more likely to be exposed to rabid foxes or other animals. It is expected that eventually a rabid fox will attack and bite some immunized dogs, such natural exposure acting as a field check of the animals immunity.

**IMMUNIZATION FOLLOWING EXPOSURE**

Three fox hounds which had been immunized in 1948 and 1949 were attacked and severely injured by a rabid dog on August 27, 1949. The following day 35 cc of antirabic hyperimmune serum and two dog doses of avianized vaccine were administered to each dog with no after-effects. These animals should be solidly immune. Five dogs all of which had received tissue vaccine in 1948 were bitten by
rabid dogs in May and June 1949. Each of these animals were injected with 2 dog doses, 10 cc of a 20 per cent suspension of avianized vaccine, two on the second day following exposure, one on the third day, one on the fourth day, and one seven days. One dog was immunized in 1945, 1946, 1947 and 1948. It had a reaction following the 1948 treatment but none following injection of the avianized vaccine in 1949. Two dogs, a pointer and a setter, were severely bitten in March 1949 and were given 50 and 20 cc of tissue vaccine respectively and the avianized vaccine May 31, 1949. One dog was injected with both tissue and avianized vaccine May 31, 1949. Previous vaccination did not interfere in any apparent manner. Bloodhounds are reported to be highly susceptible to rabies but no illness occurred in the group of four reported.

POST VACCINAL INCIDENTS

One pointer dog ran a temperature of 105 on the 4th and 5th days following immunization with the avianized vaccine, but was clinically normal. The cause of the temperature rise is unknown. A female was immunized while in season at which time she was mated. She whelped at full time, but the pups were all dead. She was hunted close to term. It is highly improbable that immunization was responsible in any manner for the death of the young.

MORTALITY

The mortality among the immunized dogs has been about normal. There have been five deaths. Two were killed on the highways by automobiles, one was killed by a train, one was shot by a neighbor as the result of a quarrel and one was shot by the owner because it was sucking eggs.

Any immunization product must meet the varied conditions which are normally encountered in the field. Participating veterinarians were asked, therefore, to immunize dogs over three months of age regardless of circumstances. It is advisable to learn of any restriction as to its use or after-effects, regardless of conditions, but consistent with proper handling and administration. If and when the product is released for general use it must meet satisfactorily all the conditions in field use.

In order to learn of any post-immunization illness or incident, one of us has checked every dog one or more times either by personal observation or by interview with the veterinarian or the owner. Any incident regardless of its importance was noted. We can account for every dog.

CATTLE

Because of the high morbidity and mortality in cattle in areas of Georgia during epidemics of fox rabies, several hundred cattle are given pre or post exposure anti-rabic treatment annually and many die of the disease. History of herd exposure in some instances is known and in others unknown. Unfortunately little research data is available as to the efficacy or dosage of killed brain tissue vaccine in cattle with the result that the dosage varies in adult cattle from 30 to 150 cc according to the opinion of the veterinarian and the finances of the owner concerned. Veterinarians and other authorities are unable to give the owners of cattle and other domestic animals statistical evidence under controlled conditions, that killed virus vaccine
will confer a solid immunity for any period of time. Indeed it is not unusual for cattle to continue to die with typical clinical rabies for a period of two or three weeks following immunization. Prophylactic immunization under these conditions are desperation measures on the part of the owner. Following newspaper publicity concerning the avianized vaccine, several cattle owners requested that their cattle be immunized, even though we explained carefully that only four cattle had been injected with the vaccine and no assurance based on experimental or field studies as to its efficacy could be given. We realized that when the avianized vaccine was finally approved that it would be used as a prophylactic measure in cattle, therefore some preliminary work should be done.

In all, four herds were immunized. Two near Cordele on May 14, and May 16, 1949, respectively and two near Atlanta on May 16, 1949. It is necessary to describe these herds individually.

No. 1—Lane Herd, eighty-one head. Fox rabies was epidemic in the immediate neighborhood of the Lane farm and one cow died of rabies on May 10, 1949, and a calf on May 13, 1949. The entire herd was immunized May 14, 1949 using one dog dose for young calves, two dog doses for heifers and four dog doses for all adult animals. Injections were made in the neck muscles. The age limit varied from about one hour to 12 years, two calves were less than one day old, in fact one was not entirely dry. Forty-seven were over one year, twenty from one to six months and the remainder or 14 under one month.

On June 2nd, or 19 days after immunization, sick animals were reported in the Lane herd. Upon investigation two were dead, one cow and a calf was down and unable to rise and two calves were showing clinical symptoms of encephalitis. These animals began showing symptoms on May 30, or 16 days following immunization. All the calves affected were three or four months old. A count of the animals disclosed that three were missing. These three are presumed to have died in the swamp pasture prior to the 10th day following immunization. Animals continued to die until June 11, when the last two sick animals were destroyed for autopsy. A total of 15 animals died. One three months old calf which was sick on the first visit made a complete recovery.

Symptoms: Loss of appetite, dehydration, eye and nasal discharge, incoordination and walking in a circle or with head thrown to one side. In some cases there was some throat involvement as evidenced by partial or complete inability to swallow water. Temperatures ranged from 103-105.5. Some animals showed considerable excitement, frequent urination and occasionally convulsions when forced to move. Salivation was present in one cow, but this saliva was negative for rabies virus as shown by mouse inoculation. One calf constantly gritted its teeth. This animal was destroyed while in fair condition and may have survived if it had been allowed to live.

Bawling, abdominal straining and tendency to attack which are the most common symptoms of rabies were entirely absent in every animal.

POST MORTEM

Extreme congestion of the superficial vessels of the brain and meninges and hydrocephalus was noticed in all animals. There was extensive edema in the nasal
AVIANIZED ANTI-RABIES VACCINATION PROJECT

sinuses and about the turbinated bones of the head. In most cases there was fluid in the pericardial sac. Petechia and ecchymoses on the endocardium and visceral peritoneum were fairly constant. Except for minor congestion of the brain macroscopic lesions were entirely absent in calf number 28 which was destroyed.

LABORATORY

The brains of all the animals which died were given a thorough laboratory examination. Negri bodies were not found on microscopic examination and cultures were negative. Mice were inoculated intracerebrally, four mice to a brain. The mice showed atypical symptoms and began dying on the fifth and sixth days. The mice brains were negative for Negri bodies. All the mice brains were passed into a second group of mice. These mice died like the first group and Negri bodies were absent except a few atypical ones in one mouse in the series from cow number Z-69.

Virus was isolated from seven of the cattle brains. Neutralization tests showed that they were rabies virus. However only 3 of the 7 strains could be grown in chick embryo tissue and then only with great difficulty. Furthermore these strains killed dogs when injected into the masseter muscles. Both of these findings are contrary to past experience with Flury strain rabies virus. The Flury strain of virus, used in production of the avianized vaccine, grows luxuriently in the chick-embryo and will not kill dogs thus indicating that seven of the cattle were infected with street virus. Flury virus was never recovered.

CAUSE OF DEATH

It is our opinion that sixteen of the animals in this herd had been exposed by a rabid fox a few days prior to immunization. If our assumption is correct, they were actively infected with street virus and then living fixed avianized virus was superimposed on the street virus which resulted in what is known as the Interference Phenomenon. The normal course of the disease was altered due to this interference and a partial immunity induced by the Flury strain of virus. The animals died with rabies before the vaccine had developed its maximum immunity response, but sufficient immunity had been developed to alter the symptoms.

Herd No. 2. This herd consisted of ten animals, nine adults and one calf. The farm was located in the heart of the fox rabies epidemic. One animal had died of rabies a day or so prior to immunization. Injections were made in the neck muscles, with the same dosage as herd No. 1. On the 10th day following immunization, one cow died according to the owner, with typical rabies. The death of this animal was not known until our routine check up. No reactions were noted and all the remaining animals are normal at this writing.

Herd No. 3. This herd consisted of ten adults and three calves. The farm is located near Atlanta where dog rabies has been very prevalent. One animal had died of rabies two days prior to immunization. Injections were made in the hip muscles. On the 12th day following immunization one cow started bellowing and straining and lactation ceased completely. The owner stated that she acted exactly like the one that died of rabies prior to immunization and that the vaccine cured a case of rabies. This cow was not observed by a veterinarian and it is reported for what it is worth. The entire herd is normal at this writing.
Herd No. 4. This herd consisted of 19 head, but only 13 adult animals were immunized, the remaining acting as controls. There was no history of exposure. Injections were made in the hip muscles. There were no unusual incidents in connection with this herd and all the animals both immunized and non-immunized remain normal.

**GOATS**

This herd consisted of about 135 animals. Two goats died of rabies immediately prior to immunization. Their owner wished particularly to protect 15 nannies which were thought to have been exposed by a rabid fox, but was willing to take his chances on the remaining animals which were therefore left as controls. Two of the immunized goats developed screw worm and were destroyed. The remainder of herd, both immunized and non-immunized remain normal.

**DISCUSSION**

The avianized chick embryo vaccine contains living rabies virus, Flury strain, which has been fixed by successive chick embryo passage. It is based on sound immunological principles, but because of the presence of living virus a field study is necessary to determine its safety before it can be released for general use.

We believe that we are in a transition stage from a killed fixed virus in emulsified brain tissue to a living virus in a medium with little brain tissue. A living virus properly attenuated should produce a long lasting immunity and the absence of brain tissue except the small amount in the embryo should permit mass immunization without the danger of post vaccination reactions and paralysis which occasionally occur following injection of brain tissue vaccine.

To date a total of 422 dogs, 121 cattle and 15 goats have been immunized with the avianized vaccine. We had planned to have at least 7,000 dogs immunized by this time, but circumstances beyond our control intervened. We have checked every immunized dog and can state definitely that with the exception of one dog with an unexplained temperature on the fourth and fifth days, there have been no complaints by the owners, there have been no abscesses at the site of injection and no post vaccination paralysis. There have been no cases of rabies among these animals and no deaths which could be attributed to the vaccine. Five dogs have died, three by accidents and two were shot. Several exposed dogs have been injected with avianized vaccine after exposure, but other antirabic vaccine or vaccine and hyperimmune serum had been administered, therefore, no single product can be given credit. These dogs have remained normal.

Among four herds of cattle, three were known to have been exposed prior to immunization. In one herd 15 died within 28 days following immunization. A certain amount of loss is expected up to 30 days in exposed herds regardless of the dose or the method of manufacture of the vaccine, when administered following exposure. One calf completely recovered indicating considerable immunity. None of the cattle which died or were sick exhibited typical symptoms of rabies, although "Street" virus was recovered from part of them. Negri bodies could not be found in the brains of any of the cattle nor in the first series of mice and in only one mouse in the second series. The presence of street virus indicates that the animals died
of street virus rabies. The symptoms and laboratory findings indicate sufficient interference on the part of the vaccine to produce an alteration of symptoms and in one animal definite protection. One cow in herd No. 2 died of rabies ten days following immunization which is not unusual and deserves no further comment. The remaining two herds remain normal to date.

In one goat herd, 15 animals were immunized and about 120 were not. Except for two deaths due to screw worm injury no incidents occurred.

It is regretted that no controls were kept in the Lane herd, but we had controls in one herd and in the herd of goats.

**SUMMARY**

Although only a limited number of animals have been immunized to date, we feel that certain conclusions can be drawn with safety. 1. Injection of the vaccine will not reproduce rabies in dogs, cattle or goats. 2. When injected with reasonable precautions it will not cause abscesses at the site of injection. 3. It will not cause post vaccinal paralysis or other reactions. 4. The vaccine can be used on previously immunized animals with no danger of reaction. 5. The vaccine is adaptable for mass immunization at clinics. 6. Further study is necessary to determine the proper dosage, the minimum time necessary to produce adequate protection and the duration of immunity in domestic animals. This has been fairly well established in dogs.
REVIEW OF CHICK-EMBRYO ADAPTED LIVING RABIES VIRUS VACCINES, WITH PRIMARY EMPHASIS ON USE IN DOGS

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All persons interested in the field of communicable diseases will agree that the various factors associated with rabies vaccination and control remain as some of our most harassing problems. Whereas no one would deny that killed phenolized or carbolized rabies vaccines, prepared under optimal conditions, have immunogenic properties and are of definite value as immunizing agents, yet they most certainly cannot be considered as entirely satisfactory products free of criticism. Time does not permit for a comprehensive review of the various shortcomings of the present rabies vaccines but the following points should be mentioned: (1) Like all other killed viral vaccines, killed rabies vaccines do not give rise to a long-lasting immunity, thus making it necessary to resort to multiple vaccinations, usually on an annual basis; (2) it is becoming increasingly apparent that the present killed rabies vaccines prepared from infected central nervous tissues cannot be considered safe for indiscriminate use in either human beings or in domestic animals since neuro-paralytic accidents are being reported ever more frequently; (3) the cost of multiple vaccinations is of significant importance.

At this particular time, of course, we are primarily interested in a discussion of facts as related to points 1 and 2. The studies to be reported were carried out by my colleague Dr. Hilary Koprowski and his associates and represent only a part of a broad research program begun some three or four years ago. We wish to express our sincere appreciation to Dr. M. V. Veldee and Dr. W. G. Workman of the Division of Biologics Control, The National Institutes of Health, Bethesda, Md., who particularly encouraged us to initiate a program of rabies research and who throughout have continued to lend their support; to Dr. Harold N. Johnson of the Laboratories of the International Health Division, The Rockefeller Foundation, New York, for his invaluable help and suggestions so willingly given at all times; to Dr. H. W. Schoening and Dr. B. T. Simms, and other officials of the Bureau of Animal Industry, U.S. Department of Agriculture, for their forthright and constructively critical suggestions; to Drs. Ralph Muckenfuss, Morris Greenberg and Herbert Baum, as well as to their associates, of the New York City Department of Health, for their splendid cooperation in organizing and collecting field trial data gained at Staten Island; to Drs. T. F. Sellers, L. E. Starr and A. L. Stafford of the State of Georgia Department of Public Health for their aid in initiating field trial studies; and to Dr. Robert F. Korns and Dr. Alexander Zeissig of the State of New York Department of Health for their kind permission and helpful cooperation in getting preliminary field studies carried out in New York State.

Before proceeding with the experimental data, some pertinent information bearing on items 1 and 2 will be reviewed briefly. First, in regard to the immunizing capacity of killed rabies vaccines, Johnson (1) showed in his experiments that a
RABIES VIRUS VACCINES

A single injection of killed brain-tissue vaccine produced a high degree of resistance in dogs to a heavy challenge dose of street virus, but that a more solid immunity apparently was induced by giving vaccine on three occasions at weekly intervals. Thus, as in the case with all killed viral vaccines, in order to have confidence in the state of immunity induced in the vaccinated host, it has been found best to give multiple vaccinations. This at first glance would seem to offer no appreciable obstacle but, as all public health officials will readily agree, the necessity to maintain an annual revaccination program is a very real and practical problem which could it be successfully eliminated would greatly facilitate the achievement of a more complete mass vaccination of the canine population.

In regard to postvaccinal neuroparalytic accidents, it is probably not out of order to mention some of the current findings in the field of human medicine before discussing the problem from the veterinary viewpoint. Recently Pait and Pearson (2) have contributed some pertinent information concerning the rabies problem in Los Angeles County and City. They report that approximately 200 rabid dogs are detected each year in that area. Some 10,000 animal bites are reported per year, with approximately 70 persons bitten by known rabid animals. Only one human case of rabies occurs per year although at least 800 persons are given rabies vaccine. On the basis of an estimated 10 to 15 per cent human fatality rate resulting from bites of rabid animals, the chances of getting rabies vary from 1:1400 to 1:2100. However, 5,500 persons received rabies vaccine during the 7-year period of 1940 to 1946, and 9 cases of severe postvaccinal reactions were reported, including one death, giving an incidence of 1:600. Thus, it is evident that the possibility of getting postvaccinal reactions following antirabies treatment is approximately twice as great as that of acquiring rabies from known dog bites. Furthermore, the consensus of opinion is that many minor cases of neuroparalytic accidents fail to be reported and that the true incidence is higher than any published tables would indicate (3).

The occurrence of neuroparalytic accidents in dogs following antirabies vaccination has not been recorded as carefully nor studied in as great detail. Mocsy (4), in his observations on neuroparalytic accidents in dogs after mass vaccinations against rabies in Budapest, calculated that 0.20 to 0.25 per cent of the vaccinated dogs showed postvaccinal complications with mortality ranging from 0.05 to 0.08 per cent. Recently Jervis, Burkhart and Koprowski (5) reported the occurrence of postvaccinal paralysis in 4 out of 60 dogs of the Great Pyrenees breed that had received a single injection of 10 ml. of a phenolized antirabies vaccine containing 20 per cent horse-brain tissue. Of possible significance is the observation that of 30 dogs of the St. Bernard breed, which were vaccinated with the same material under identical conditions, none showed any ill effects. The 4 Great Pyrenees became paralyzed 14 to 17 days after vaccination; one died before studies were started, 2 were sacrificed when moribund, and one recovered although some sequelae remained. No infectious agent was recovered from the central nervous tissues of the 2 dogs by subinoculation into various laboratory animals. The pathological features, which were those of a multiple disseminated encephalomyelitis of the demyelinating type, were similar to those described in human cases of postvaccinal paralysis and in the so-called isoallergic encephalitis of monkeys (6, 7). In addition mention may be made of 2 cases of postvaccinal paralysis that occurred in our laboratory animals. Of
60 dogs of mixed mongrel breeds vaccinated with a single 5 ml. dose of phenolized vaccine containing 20 per cent horse-brain tissue, 2 developed postvaccinal paralysis (8).

The purpose of this report is to review the data (9) that have been obtained thus far in the use of the chick-embryo adapted Flury strain of rabies virus. It might be mentioned that at least 5 additional strains of rabies virus have been adapted to serial passage in developing chick embryos but on the basis of preliminary tests carried out with each of the strains, the experimental data indicate that the Flury strain is the one of choice to use as a living virus immunizing agent.

The Flury strain of rabies virus was furnished us through the courtesy of Dr. Harald N. Johnson. This strain was isolated (10) from the spinal cord of a child who died of rabies, and was passed serially by Dr. Johnson in the brain tissues of 1-day old chicks (11). Following 100 serial passages in chicks, the virus showed a marked loss of pathogenicity for rabbits, as determined by intracerebral inoculations, and lessened pathogenicity for mice, as determined by comparative titrations in chicks and mice. Dogs inoculated intramuscularly showed no signs of infection but when they were inoculated intracerebrally they developed rabies. However, the extremely important observation was made that although rabies was induced in dogs following intracerebral injection of the virus, yet no virus could be found in their salivary glands (12).

After the Flury strain was adapted to the chick embryo (13) it continued to show differences in its pathogenicity from other strains of fixed rabies virus even in the early levels of egg passage. It apparently retained its full virulence and invasiveness by the intracerebral route for mice, cotton rats, hamsters, guinea pigs and possibly 1-day old chicks, with LD₅₀ titers showing a range of 10⁻⁴⁻⁵ to 10⁻⁴⁻⁵. On the other hand, although occasional rabbits injected intracerebrally died, the death rate was irregular and it was possible to isolate virus only infrequently from rabbits that died following intracerebral inoculation with 10 per cent embryo tissue. Rabbits given intramuscularly even the most concentrated virus suspensions at various chick-embryo passage levels showed no signs of infection whatsoever. Similar results, showing that rabies virus becomes modified in virulence for rabbits after adaptation to chick embryos, were reported by Bernkopf and Kligler (14) and Dawson (15).

Guinea pigs and hamsters injected extraneurally with fairly heavy concentrations of low passage level chick-embryo Flury virus showed greater susceptibility than did rabbits and although the results were not uniform the evidence indicated hamsters to be more susceptible than guinea pigs. Higher passage levels indicated the virulence of the virus to be decreased with further passage so that only occasionally would a single guinea pig out of ten or more, inoculated with 20 per cent tissue suspensions, show any signs of paralysis. However, the surviving guinea pigs subsequently challenged with street virus strains of rabies practically always were found to be solidly immune.

The street virus strains used as challenge materials in all these studies were the NYC, obtained from the infected salivary glands of a rabid dog in New York City, and the Zillwood, obtained from the central nervous tissue of a British soldier who died following infection in India. Without exception all challenge inoculations made in dogs were conducted with suspensions of infected canine salivary glands removed
from dogs dying of furious rabies. It is pertinent to mention at this point that the submaxillary salivary glands, as has been shown by Johnson, are the best source of virus from tissue other than that of the nervous system, and they may contain even more virus than brain tissue as determined by titration tests. All of the street virus challenge material is stored in flame-sealed Pyrex glass ampoules in the CO₂-box and is always titrated before use by duplicate intracerebral injections of mice.

Table 1 shows the results obtained in two representative experiments in rabbits. In both experiments the rabbits were inoculated intramuscularly on two occasions at a 14-day interval with 2 ml. of 10 per cent chick-embryo suspension, Flury strain. None of the 86 rabbits showed any ill effects following immunization. In experiment number 1, 46 rabbits, divided into 4 groups, were challenged for immunity 14 days after last injection with 1 ml. each of 1:5, 1:10, 1:20 or 1:40 dilutions of guinea pig brain infected with fixed strain of rabies. It is seen that only 2 of the 46 succumbed and both of these had received the 1:10 challenge dose. In contrast, the majority of

<table>
<thead>
<tr>
<th>RABBIT</th>
<th>INTERVAL BETWEEN IMMUNIZATION AND CHALLENGE</th>
<th>MORTALITY RATIO OF RABBITS CHALLENGED WITH VIRUS DILUTIONS: **</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>days</td>
<td>1:5</td>
</tr>
<tr>
<td>Immune</td>
<td>14</td>
<td>0/11</td>
</tr>
<tr>
<td></td>
<td>4/5</td>
<td>4/5</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immune</td>
<td>40</td>
<td>0/10</td>
</tr>
<tr>
<td></td>
<td>2/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Injected intramuscularly twice at 14 day interval with 2 ml. of 10 per cent chick-embryo suspension.
** Injected intramuscularly with 1 ml. of respective dilutions of guinea pig brain infected with fixed rabies virus.

the control rabbits died. In the second experiment the same type of test was carried out in 4 groups of 10 rabbits each, except that the challenge dose was given 40 days after immunization. Only one of the 40 immunized rabbits died, and this again with the 1:10 challenge dose, whereas the control rabbits showed death losses ranging from 20 to 60 per cent.

Table 2 shows the results obtained with guinea pigs inoculated intramuscularly with 1 ml. of decreasing concentrations (ranging from 1:5 to 1:1,280) of lyophilized chick-embryo suspensions of Flury strain. At intervals ranging from 29 to 47 days thereafter, the animals were challenged for immunity by intramuscular injections with 1 ml. of a 10 per cent suspension of canine salivary glands infected with either the NYC or the Zillwood strains of street rabies virus. The results show that complete protection was given to all guinea pigs which received the 1:5 and 1:20 dilutions of vaccine and that less satisfactory results were obtained in those guinea pigs which received the higher dilutions of vaccine, but even here there were indications of some protective value. These rather interesting figures would seem to indi-
cate a possible linear relationship to exist between the dilution of infected tissue suspension used for immunization and the per cent mortality rate. To extend the suggested linear relationship further it would appear that mortality rates of approximately 80 to 100 per cent would be attained with tissue suspensions diluted to 1:5120 and 1:20,480, respectively. However, this speculation has not been subjected to experimental confirmation, as yet.

Encouraged by the results obtained in rabbits and guinea pigs, experiments were then carried out in dogs to determine the following: (1) could the chick-embryo adapted living virus be used with safety in dogs, and (2) would the living virus vaccine immunize the dogs in the same degree as it had been observed for rabbits and guinea pigs?

Here it should be emphasized that tests for safety of the product were carried out not only by injecting dogs by the subcutaneous and intramuscular routes but also by direct inoculation into the masseter muscles. This particular type of test was employed as it was shown to be a highly sensitive one for inducing rabies in dogs, as demonstrated by Johnson (11).

Table 3 shows the results obtained in a few of several typical experiments to determine the safety of the product in dogs. Various passage levels of virus, ranging from the 22nd to the 74th transfer in chick embryos, were used. None of the dogs showed any signs of illness and remained well during observation periods ranging from 2 to 12 months, irrespective of the route of inoculation used or the number of injections and dose administered. Repeated experiments carried out in this laboratory have confirmed the observation that the chick-adapted Flury strain of rabies virus given parenterally is absolutely innocuous for dogs. To date at least 220 dogs have been given 5 ml. injections of a 20 per cent tissue suspension and none of them have shown any ill effects during at least 8 months' observation.

Having demonstrated that the product is safe for dogs, it next was necessary to determine whether the product would immunize dogs against heavy challenge doses of street virus of known virulence. Dogs were inoculated into the muscles of the

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>CHALLENGE AFTER VACCINATION</th>
<th>MORTALITY RATIO OF CHALLENGED GUINEA PIGS IMMUNIZED WITH DILUTIONS OF VACCINE:</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embryo Passage</td>
<td>LD₅₀ Titer in Mice</td>
<td></td>
<td>1:5</td>
</tr>
<tr>
<td>75</td>
<td>1:560</td>
<td>29*</td>
<td>0/8</td>
</tr>
<tr>
<td>77</td>
<td>1:1000</td>
<td>47*</td>
<td>0/9</td>
</tr>
<tr>
<td>86</td>
<td>1:400</td>
<td>45*</td>
<td>0/10</td>
</tr>
<tr>
<td>74</td>
<td>1:630</td>
<td>45*</td>
<td>0/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45**</td>
<td>0/10</td>
</tr>
</tbody>
</table>

* NYC street virus.  
** Zillwood street virus.
RABIES VIRUS VACCINES

* 20 per cent chick-embryo suspension.
** 40 per cent chick-embryo suspension.

**TABLE 3.—Parenteral Inoculation of Dogs with Flury Strain Virus**

<table>
<thead>
<tr>
<th>EGG PASSAGE</th>
<th>ROUTE</th>
<th>VOLUME</th>
<th>NUMBER OF DOGS</th>
<th>OBSERVATION PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ml.</td>
<td>Died</td>
<td>Survived</td>
</tr>
<tr>
<td>22</td>
<td>Intramasseter</td>
<td>0.5 × 2*</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>22</td>
<td>Intramasseter</td>
<td>0.1 × 2*</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>22</td>
<td>Subcutaneous</td>
<td>5.0*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>Intramuscular</td>
<td>5.0*</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>74</td>
<td>Intramasseter</td>
<td>0.2 × 2**</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>74</td>
<td>Intramuscular</td>
<td>5.0**</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

* 20 per cent chick-embryo suspension.
** 40 per cent chick-embryo suspension.

**TABLE 4.—Immunization of Dogs with Flury Strain Virus**

<table>
<thead>
<tr>
<th>Egg Passage</th>
<th>LD50 Titer in mice</th>
<th>Post-vaccination</th>
<th>Mortality ratio of dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>weeks</td>
<td>Vaccinated</td>
</tr>
<tr>
<td>36</td>
<td>10−3.45</td>
<td>5</td>
<td>0/6</td>
</tr>
<tr>
<td>40</td>
<td>10−3.45</td>
<td>9</td>
<td>0/9</td>
</tr>
<tr>
<td>40</td>
<td>10−4.00</td>
<td>7</td>
<td>0/7</td>
</tr>
<tr>
<td>60</td>
<td>10−3.70 or &lt;</td>
<td>3</td>
<td>0/8</td>
</tr>
<tr>
<td>74*</td>
<td>10−4.75</td>
<td>5</td>
<td>0/6</td>
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<td>74</td>
<td>10−4.75</td>
<td>27</td>
<td>0/4</td>
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<tr>
<td>75</td>
<td>10−4.75</td>
<td>5</td>
<td>0/4</td>
</tr>
<tr>
<td>77</td>
<td>10−4.00</td>
<td>7</td>
<td>0/10</td>
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<tr>
<td>79</td>
<td>10−3.20</td>
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<td>0/8</td>
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<tr>
<td>80</td>
<td>10−3.60</td>
<td>5</td>
<td>0/6</td>
</tr>
<tr>
<td>84</td>
<td>10−3.80</td>
<td>7</td>
<td>2/8</td>
</tr>
</tbody>
</table>

* 40 per cent chick embryo suspension, all others 20 per cent.
† Letters in parentheses indicate that same groups of dogs served as controls for animals in the tests at various egg-passage levels.

material showed LD50 titers of 10−3.25 to 10−4.35 for mice. Both fresh and lyophilized chick-embryo suspensions were used as vaccine, with apparently equally good results. Of a total of 76 dogs vaccinated with the Flury strain only 2 died after the massive challenge inoculation, whereas 32 of the 46 control dogs died (16). It may be
of some significance that the 2 vaccinated dogs which died following challenge had received a high egg-passage level of the Flury strain chick-embryo suspension which showed a low LD₉₀ titer for mice, namely $10^{-2.5}$.

**COMMENTS**

The excellent results obtained in the above tests with dogs are in full accord with those achieved in rabbits and guinea pigs, and amply confirm the fact that the Flury strain of chick-embryo adapted rabies virus is highly immunogenic for all animals tried thus far.

In this connection it may be mentioned that through the cooperation of the Bureau of Animal Industry, U. S. Department of Agriculture, a special permit was granted to carry out field trials with the Flury strain chick-embryo adapted rabies vaccine in the following three areas: (1) The State of Georgia, under the supervision of Dr. L. E. Starr and Dr. Thomas E. Sellers of the State of Georgia Department of Health; (2) the State of New York, under the supervision of Dr. Alexander Zeissig, Department of Health, State of New York, and (3) Staten Island, New York City, under the direct supervision of Drs. Ralph Muckenfuss, Morris Greenberg and Herbert Baum of the New York City Department of Health.

Drs. Starr, Stafford and Dye (17, 18) have reported in detail the results obtained in Georgia, which may be summarized as follows: To date 422 dogs, 121 cattle and 15 goats have been given the Flury strain chick-embryo adapted rabies vaccine since May 14, 1949. Each immunized dog was carefully checked repeatedly and with the exception of one dog, which showed an unexplained rise in temperature on the 4th and 5th day, there were no complaints, no abscesses at the site of inoculation, no postvaccinal paralysis, no cases of rabies, and no deaths attributable to the vaccine. The goats showed no untoward effects. Of the four herds of cattle vaccinated with the Flury strain vaccine, three undoubtedly had been exposed to rabies prior to the vaccination, which makes evaluation of the efficacy of the vaccine somewhat difficult. However, in the fourth herd, in which there was no history of exposure, no unusual incidents occurred and all animals, both vaccinated and unvaccinated remained normal.

The field trial studies on Staten Island were begun on July 5th and ended on September 10, 1949 (19). During that period a total of 6,757 dogs were vaccinated with 5 ml. of a 20 per cent suspension of embryos infected with the 66th and 67th egg passage of the Flury strain of virus. At first some objections were raised by the veterinarians to the use of the vaccine by the intramuscular route but later they became enthusiastic about it. There were only 5 casualties during the entire program, 2 reactions and 3 deaths. These were as follows:

1. A spitz terrier, 6 years old, died immediately after inoculation. Diagnosis: heat stroke. No Negri bodies were found on laboratory examination.

2. A 16-year old poodle, vaccinated July 20th, died July 27th. Diagnosis: old age. No Negri bodies were found on laboratory examination.

3. A 2½-year old collie cross, vaccinated September 7th, died September 8th. Diagnosis: edema of larynx and heart attack. No Negri bodies were found on laboratory examination.

4. A 3-year old cocker spaniel; owner reported that the dog did not walk properly.
Placed in shelter under observation for one day. The dog was returned to the owner and no further complaint was made.

5. A 7-month old poodle, vaccinated on July 30th, became lame in right hind leg into which the inoculation had been given. The dog was placed under observation from August 5th to the 10th, during which time the lameness gradually disappeared but then the animal developed tremor of the right front leg. The dog was released to the owner, who decided to have the dog destroyed, which was done on August 11th. Apparently no pathological studies or viral tests were done.

The conclusions drawn from this field trial were that the Flury vaccine is a satisfactory product, and none of the occurrences associated with the five dogs mentioned above were considered as evidence that the vaccine was at fault.

The same inoculum was employed in the field trial studies in Rockland County, New York, and 150 dogs were vaccinated. In not a single instance was any serious reaction observed after the inoculations.

The duration of immunity in dogs, following vaccination with the Flury strain chick-embryo adapted rabies vaccine, is now under study in a large number of animals being held for this purpose at the Pearl River laboratory. In addition, arrangements have been made whereby similar long-term immunity tests will be carried out by Dr. Ernest S. Tierkel and Dr. James H. Steele and their colleagues at the Montgomery, Alabama, laboratories of the Veterinary Division of the U. S. Public Health Service (20).

REFERENCES


REPORT OF THE COMMITTEE ON RABIES


Your Committee is cognizant of developments in the field of rabies virus propagation and rabies vaccine production. The latest information on these subjects has been ably presented by the previous speakers.

It is evident to all members of your Committee that the control and eradication of rabies entails considerably more than the administration of vaccine as an annual precautionary measure on the part of individual dog owners and in mass vaccination campaigns. It has been pointed out for many years that the program, to be successful, must be based on the cooperation of the general public in the control of infected animals, the control of susceptible animals, and suitable vaccination procedures. In almost all instances the continuing interest of the public is the limiting factor.

It has been demonstrated that rabies can be controlled and eradicated in cities, suburban and rural areas, particularly when the dog is the main host. The spread of the disease in wild species of animals has posed a problem which has not always been satisfactorily solved by man-made means.

The organization of rabies control in New York State under the State Department of Health through the Interdepartmental Rabies Committee is an outstanding example of a concerted and well-planned effort. The publication of the Rabies Review of the State Department of Health, Albany 1, New York, is called to the attention of all who are charged with disease control.

The regional organization between New York, Pennsylvania, and New Jersey is also called to your attention as an effort at control on a large area basis. Unquestionably there are other examples of workable organizations, to which your Committee does not refer.

There is attached to the Committee report for purposes of publication in the Proceedings the tabulation of cases of rabies in the United States during the year 1948, prepared by the Bureau of Animal Industry, U. S. Department of Agriculture.

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

June 3, 1949

INCIDENCE OF RABIES IN THE UNITED STATES

CALENDAR YEAR 1948

Statistics on the number of cases of rabies in the United States in the calendar year 1948 have been collected by the Bureau of Animal Industry of the U. S. Department of Agriculture.

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## Table 1.—Rabies in the United States by States during the Year 1948

<table>
<thead>
<tr>
<th>State</th>
<th>Dogs</th>
<th>Cattle</th>
<th>Horses</th>
<th>Sheep</th>
<th>Swine</th>
<th>Cats</th>
<th>Goats</th>
<th>Miscellaneous</th>
<th>Man</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>253</td>
<td>27</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td>0</td>
<td>Fox</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Arizona</td>
<td>34</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<td>7</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Arkansas</td>
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* Includes coyote, fox, rabbit, mouse, gopher, ground squirrel, rat, squirrel, skunk, wild cat, raccoon, opossum, muskrat, and deer.

**CASES OF RABIES REPORTED IN VARIOUS STATES IN 1948**

276
There were 8,508 cases reported. There were 6,610 cases in dogs, 599 in cattle, 34 in horses, 14 in sheep, 36 in swine, 378 in cats, 5 in goats, 819 miscellaneous, and 13 in man.

This material was compiled from a questionnaire sent by the Bureau to the livestock sanitary official and the health officer in each state. In some instances, data from both sources in a state were used. When there was a difference in the number of cases reported for the same species, the greater number was used, since it is believed that the reported cases do not represent all of the cases that occurred.

Table 1 gives the number of cases reported in each state by species.

The map shows the distribution of the cases by states.

Note: This report supersedes the report issued April 28, 1949. The revision was necessitated because of a correction in the figures for Indiana.
REPORT OF THE NOMINATING COMMITTEE

Vice-President Dr. C. P. Bishop: We will have the report on the Nominating Committee.

Gentlemen, I told you at the opening of this session that our President had to leave and I find also that our Second Vice-President isn't available because he had to leave the city, so we have rather an unusual situation here and we hope we may be excused for following an unusual procedure in that the Secretary will receive the report of the Nominating Committee and take over in the nomination of the officers.

Dr. Hendershott: We now call for the report of the Chairman of the Nominating Committee, Dr. Jean Knapp of Florida.

Dr. Knapp: Mr. Secretary and Gentlemen of the Association: Your Committee has labored diligently, and offers for your approval, the following:

For President, C. P. Bishop, Harrisburg, Pennsylvania; First Vice-President, F. E. Mollin, Denver, Colorado; Second Vice-President, Ralph West, St. Paul, Minnesota; Third Vice-President, T. C. Green, Charleston, West Virginia.

Submitted by Ivan G. Howe, E. P. Anderson, and Jean Knapp.

Dr. Hendershott: We now open the nominations for nominations from the floor. Are there any nominations for the office of President? First Vice-President? Second Vice-President? Or Third Vice-President?

Dr. Hall: Mr. Chairman, I am, of course, from across the border, Canada, a large country, equal, I believe, in square miles, or a little larger than the United States. We have a large livestock industry in that country and we have a good veterinary profession.

We have been, over the years, having difficulty in uniting our veterinary profession in one voice so that we may speak to the powers that be in one voice. We have just accomplished that fact by having our first annual meeting in Winnipeg, Manitoba, during the month of September. You were very good to send us The President of the A.V.M.A., to give us a hand at that meeting.

We are probably going through a period of evolution. We need support at this time because our problems are your problems. Your diseases are our diseases, and when you are fighting against the introduction of foot and mouth disease into this country, we are equally fighting to keep it out of Canada to also protect this country.

We never had a period in our time when we needed the support of the United States Livestock Sanitary Association more than we need it now. We feel that this is one of the greatest organizations of its kind, not only on the American continent, but in the world, and we need help from you at this particular time.

I would like to place in nomination for Third Vice-President the Veterinary Director-General of Canada, Dr. T. Childs.

Dr. Hendershott: Are there any other nominations from the floor?

I just want to say in passing that I agree with the gentleman who just spoke. I think we are the greatest organization on the face of the globe.

Will someone move that the nominations be closed, if there are no further nominations from the floor?
DR. SCHWAB: I move that the nominations for the office of President, First Vice-President, and Second Vice-President be closed, and that the Secretary be instructed to cast the unanimous ballot of the convention in favor of the officers nominated.

DR. SCHWARTZ: I second the motion.

. . . The motion was put to a vote and carried . . .

DR. HENDERSHOTT: I declare the unanimous ballot of the Association cast for Dr. Bishop for President, Mr. Mollin for First Vice-President, and Dr. West for Second Vice-President.

Do you wish to vote by rising vote, voice vote, or written ballot for your choice for third Vice-President?

We will not present to you the names in the order in which they were nominated for the office of Third Vice-President, and I will ask those of you who are voting for Dr. T. C. Green arise so that your vote may be counted. I count twelve votes for Dr. Green.

Those in favor of T. Childs of Canada, please rise. I count twenty-one in favor of Dr. T. Childs for Third Vice-President.

ELECTION AND INSTALLATION OF OFFICERS

Gentlemen, that is your slate. It is now my privilege and pleasure to introduce to you the gentleman who will serve in this Association as president for the ensuing year. He needs no introduction because you have had the pleasure of seeing him conduct the meeting this morning. You all know him for the rotund fellow who is too well fed, as most Pennsylvanians Dutchmen are, but who has a clear mind, a heart of gold, the vigor and vitality to carry on the important job of President of this Association.

I know that I voice your sentiments when I say that we feel that we are turning the gavel of the presidency of this Association over to a most worthy and competent person. (Applause)

VICE-PRESIDENT BISHOP: Thank you, Dr. Hendershott.

Gentlemen, I am indeed grateful for this honor and privilege to serve as your President for the ensuing year. It is especially pleasing that this will take place in the Buckeye State of our good neighbors in Ohio. The Association, during the years, has been credited with many accomplishments and I am sure if we adhere to the principles and ideals of this Association and have the cooperation of the livestock and poultry industries that we must have, and other members of this Association, and our neighbors in Canada, that we will make further progress in animal disease and animal health problems so essential and necessary for an enduring sound livestock economy. Thank you. (Applause)

DR. HENDERSHOTT: Thank you very much, Dr. Bishop.

We learned that Mr. Mollin has departed.

Will someone escort Dr. West, the kindly looking gentleman from Minnesota up to the rostrum, please?

Dr. Sugg, will you endeavor to assist our portly gentleman from Canada up this way, sir? He is right behind you.

I think it is only fair that we have the officers stand here before you so you can tell what manner of men we have elected to the offices of this Association. We have a
fond hope that as you see this beef trust up here, you may have a closer association with your Secretary and Vice-Presidents, and impart to Dr. West that love of food or that perhaps we can cut down on his thyroidal activities so that when he finally ascends the Presidential chair, he can boast of a waist measuring 44 inches in circumference.

It is certainly a pleasure and I know you see for yourselves that the affairs of this great Organization are going to be in good hands during the ensuing year when we have one of these tough regulatory officials, so-called, a man that is always thinking on the beam, who is sold on his convictions, and stands by his convictions year in and year out, come hell or high water.

It is a pleasure to present to you my good friend Dr. Ralph West from Minnesota. (Applause)

Dr. West: Thank you, Dr. Hendershott, and Members of this great Association. It is indeed an honor, one of the greatest honors that has ever come my way, to be elected as Vice-President of this Association.

I extend my thanks and assure you that I will try to carry on and be of such assistance as I may to the other officers of the Association. I thank you. (Applause)

Dr. Hendershott: Last, but not least, and as you know, he got here on his own, for which we are very thankful, Dr. Childs. I have heard it said many times that in this Association the election of officers is just a matter of a few fellows getting together and deciding who should be honored next. This year we have had a concrete demonstration that things don't have to work in that fashion.

I think it is a good, wholesome thing, once in awhile, that we have nominations from the floor as we did this morning, and to have the election of an officer presented by a member on the floor. That is no aspersion on the gentleman who failed to make the grade. He, too, is an excellent man.

We do welcome very sincerely, and we do appreciate sincerely, the fact that we have a good neighbor on the north. I am personally interested in the statements that the gentleman who nominated our Third Vice-President made when he brought to our attention the fact that they, too, are interested in the disease control and programs of eradication the same as we are here, and we bid them Godspeed with several of the diseases they have yet to eradicate.

I know the work is going forward in Canada in good order under the guidance of our Third Vice-President, and it is a pleasure to present to you Dr. T. Childs, the Veterinary Director-General of the Dominion of Canada, who will serve as Third Vice-president during the coming year. Dr. Childs. (Applause)

Dr. Childs: Mr. Chairman, and Gentlemen: I am very deeply appreciative of the honor which you have conferred upon me at this time and, too, the veterinary profession of Canada. I cannot say more than that I am appreciative.

Your approach to these problems is the same as ours and your proceedings here, your actions here, are of vital concern to us at all times. I will do the very best I can to work with the balance of your officers that you have elected.

That is all I can say except to thank you again for the confidence you have reposed in me in electing me to this office. I thank you very much. (Applause)
VICE-PRESIDENT BISHOP: We will now have the film on Trichomonas Foetus Infection.

...A short film on trichomonas foetus infection was shown by courtesy of Dr. Hess...

VICE-PRESIDENT BISHOP: Thank you, Dr. Hess. Will you please rise?

This is the gentleman to whom we are indebted for the showing of this film.

(Applause)

The meeting will stand adjourned.
CONSTITUTION AND BY-LAWS
OF THE
UNITED STATES LIVESTOCK SANITARY ASSOCIATION

ARTICLE I—Name

The name of this Association shall be "The United States Livestock Sanitary Association."

ARTICLE II—Purpose

The purpose of this Association shall be the study of livestock sanitary science, milk and meat hygiene, and the dissemination of information relating thereto, the unification so far as possible of the laws, regulations, policies and methods pertaining to milk and meat hygiene, and to the prevention, control and eradication of transmissible livestock diseases; to maintain co-ordination among the various livestock regulatory organizations, and to serve as livestock sanitary science clearing house between this Association and the following: The livestock owner, the livestock sanitarian, the milk and meat hygienist, the veterinary practitioner, the transportation and stock yard companies, the milk and meat producing and distributing companies, and various other interested agencies. The word "livestock" as herein used shall be understood to include poultry.

ARTICLE III—Membership

There shall be two kinds of members—Official and Individual.

The livestock sanitary departments of each state also the United States, and the Canadian, Cuban and Mexican governments, The Territories, Puerto Rico and the Virgin Islands shall be eligible to official membership in this Association and be represented on the Executive Committee by the livestock sanitarian executive official.

Any person engaged in livestock sanitary work for federal, provincial, state, territory, county or municipal governments and any other person interested in livestock sanitation or milk and meat hygiene may be elected to individual membership.

ARTICLE IV—Meetings

The meetings of this Association shall be annual and special.

ARTICLE V—Officers

The officers of this Association shall be: President, First Vice-President, Second Vice-President, Third Vice-President, Secretary-Treasurer, and an Executive Committee.

The officers of this Association shall hold office for one year or until their successors have been duly elected and qualified.

EXECUTIVE COMMITTEE

The Executive Committee shall be composed of the executive officer representing the livestock sanitary departments of the various States and Territories, the Chief
of the United States Bureau of Animal Industry, the Veterinary Director General of Canada, the executive regulatory officer of Cuba and Mexico, The Territories, Puerto Rico and the Virgin Islands, and the elective officers of this Association.

The Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies.

All recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee.

The First Vice-President shall be ex-officio chairman of the Executive Committee.

The Executive Committee shall elect yearly a Secretary-Treasurer for the Association. The Secretary-Treasurer shall receive such salary and allowance as may be fixed by the Executive Committee.

The Executive Committee shall cause to be audited annually or oftener if deemed necessary, the receipts and disbursements of the Secretary-Treasurer, and shall have authority to hear and determine all complaints filed before it in writing relative to the conduct of any member; and shall have authority to accept or reject applications for individual membership properly placed before them. Three negative votes shall disqualify for such membership.

ARTICLE VI—Program Committee

The President, the Chairman of the Executive Committee and the Secretary-Treasurer and the Chairman of the respective committees shall constitute the program Committee. It shall be the duty of the officers of the Program Committee to make the necessary arrangements and provide the program for the annual and special meetings.

ARTICLE VII—Duties of Officers

1. President: It shall be the duty of the president to preside at all meetings of this Association; to appoint all committees excepting the Executive and Officer Fraction of the Program Committees; to call special meetings of the Association whenever he considers the holding of such meetings necessary for the good of the livestock industry or upon the written request of five members of the Executive Committee. The president shall be an ex-officio member of all committees.

2. First Vice-President: The first vice-president shall be chairman of the Executive Committee. In the absence of the president, he shall preside at the meetings of the Association. In the event of the absence, disability or resignation of the president he shall perform all duties of the president. He shall be an ex-officio member of the Executive and Program Committees.

3. Second Vice-President: The second vice-president shall assume the duties of the president in the event of the absence, disability or resignation of the president and first vice-president. He shall assume the chairmanship of the Executive Committee in the event of the absence, disability or resignation of the first vice-president. He shall be an ex-officio member of the Executive Committee.

4. Third Vice-President: The third vice-president shall assume the duties of the president in the event of the absence, disability or resignation of the president, first vice-president and second vice-president. He shall assume the chairmanship of the Executive Committee in the event of the absence, disability or resignation of the
first and second vice-presidents. He shall be an ex-officio member of the Executive Committee.

5. Secretary-Treasurer: The Secretary-Treasurer shall keep an accurate record of the proceedings of the Association. Whenever authorized so to do by the Executive Committee he shall publish said proceedings and distribute them to the members of the Association. The Secretary-Treasurer shall also keep an accurate record of the proceedings of the Executive Committee and shall furnish a copy to each member of said Executive Committee. He shall forward to each Executive Committee member a copy of each regulation approved by the Association.

He shall keep an accurate account of all Association moneys received and disbursed. He shall also present to the Chairman of the Executive Committee a list giving the name, occupation and address of each applicant for individual membership for the approval of the Executive Committee. He shall perform such other duties as may be authorized and prescribed by the Executive Committee. He shall be ex-officio secretary of the Executive Committee, also an ex-officio member and secretary of the Program Committee. He shall be bonded for not less than ten thousand dollars.

**ARTICLE VIII—Amendments**

The constitution of this Association may be amended by a two-thirds vote of the members of the Association present and voting at an annual meeting, provided that the specific amendment to be acted upon shall have been presented in writing at a previous annual meeting and further provided that the amendment has received the approval of the Executive Committee.

**BY-LAWS**

**ARTICLE I—Order of Business**

Registration.
Call to Order.
Report of Secretary-Treasurer.
President's Address.
Reading of Papers.
Committee Reports.
Discussion.
Unfinished Business.
New Business.
Nomination and Election of Officers.
Adjournment.

A suspension of the By-Laws may be made by a two-third majority for the purpose of changing the order of business or to facilitate important business.

**ARTICLE II—Applications for Membership**

Applications for individual membership shall be made in writing to the Secretary-Treasurer. The application shall give the name, occupation and address of the applicant and shall be accompanied by a fee of three dollars ($3.00), which amount
shall include the membership dues for one year. Applications shall be presented in proper form to the Secretary-Treasurer, who shall in turn submit them to the Executive Committee.

An individual member may be expelled for cause by the Executive Committee.

**ARTICLE III—Meetings**

The annual meetings shall unless otherwise determined not less than thirty (30) days in advance by a majority of the members of the Executive Committee, be held at Chicago, Illinois, during the time of the International Livestock Exposition. The place for holding the meetings in Chicago as well as the duration of said meetings shall be determined by the Officer Members of the Program Committee of the Association.

The place for holding special meetings shall be determined by the President with due regard to the wishes of the members of the Executive Committee, the subject matter to be considered, accessibility, and the information to be obtained. The notice of time and place of holding a special meeting shall be mailed to the members at least thirty days prior to the date fixed for the special meeting.

**ARTICLE IV—Quorum**

Twenty-five members of the Association shall constitute a quorum.

Five members of the Executive Committee shall constitute a quorum.

**ARTICLE V—Dues**

The dues for individual membership in this Association shall be three dollars ($3.00) per annum, payable in advance (on or before January 1st of each year) to the Secretary-Treasurer of the Association.

The dues for official memberships shall be fifty dollars ($50.00) each per annum, payable in advance (on or before January 1st each year) to the Secretary-Treasurer of this Association.
FIFTY-FOURTH
ANNUAL MEETING

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