Eighteenth Annual Meeting

OF THE

United States Live Stock
Sanitary Association

CHICAGO, ILLINOIS
FEBRUARY 16, 17 and 18, 1915
NOTICE

OWING to the high cost of publication and our limited revenue, the proceedings have been condensed as much as possible without eliminating essentials.
# CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers and Committees</td>
<td>6</td>
</tr>
<tr>
<td>Constitution and By-Laws</td>
<td>8</td>
</tr>
<tr>
<td>List of Members</td>
<td>249</td>
</tr>
<tr>
<td>Opening Address, by Joseph Hughes, President Chicago Veterinary College</td>
<td>10</td>
</tr>
<tr>
<td>Response to Opening Address, by C. M. Haring</td>
<td>11</td>
</tr>
<tr>
<td>President's Address, by S. H. Ward</td>
<td>12</td>
</tr>
<tr>
<td>Foot-and-Mouth Disease—</td>
<td></td>
</tr>
<tr>
<td>Foot-and-Mouth Disease, by A. D. Melvin and J. R. Mohler</td>
<td>16</td>
</tr>
<tr>
<td>Foot-and-Mouth Conditions in Various States:</td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>27</td>
</tr>
<tr>
<td>Delaware</td>
<td>27</td>
</tr>
<tr>
<td>Indiana</td>
<td>30</td>
</tr>
<tr>
<td>Iowa</td>
<td>31</td>
</tr>
<tr>
<td>Illinois</td>
<td>33</td>
</tr>
<tr>
<td>Kentucky</td>
<td>35</td>
</tr>
<tr>
<td>Michigan</td>
<td>36</td>
</tr>
<tr>
<td>Montana</td>
<td>38</td>
</tr>
<tr>
<td>New York</td>
<td>41</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>43</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>46</td>
</tr>
<tr>
<td>Tick Eradication—</td>
<td></td>
</tr>
<tr>
<td>Recent Developments in Tick Eradication, by Peter F. Bahnsen</td>
<td>67</td>
</tr>
<tr>
<td>Farm and Live Stock Sanitation—</td>
<td></td>
</tr>
<tr>
<td>The Use of Concrete for Sanitary Farm Improvements, by L. A. Warner</td>
<td>77</td>
</tr>
<tr>
<td>Worthless Disinfection. A Serious Problem in Live-Stock Sanitation, by J. T. Ainslie Walker</td>
<td>225</td>
</tr>
<tr>
<td>Blackleg—</td>
<td></td>
</tr>
<tr>
<td>The Recognition of Atypical Forms of Blackleg in the United States, by K. F. Meyer</td>
<td>91</td>
</tr>
<tr>
<td>Hog Cholera—</td>
<td></td>
</tr>
<tr>
<td>Uniform Methods for Control of Hog Cholera, by Paul Fischer</td>
<td>112</td>
</tr>
<tr>
<td>Standardization of Anti-Hog-Cholera Serum, by Thomas P. Haslam</td>
<td>118</td>
</tr>
<tr>
<td>Method of Manufacturing Anti-Hog-Cholera Serum and Virus, by F. A. Bolser</td>
<td>123</td>
</tr>
<tr>
<td>The Refinement of Hog-Cholera Serum, by John Reichel</td>
<td>127</td>
</tr>
<tr>
<td>Anti-Hog-Cholera Serum Production in Kentucky, by Robert Graham</td>
<td>138</td>
</tr>
<tr>
<td>Control Work—</td>
<td></td>
</tr>
<tr>
<td>Suggestion Relative to the Control of Interstate Movements of Live Stock, by J. J. Gibson</td>
<td>166</td>
</tr>
<tr>
<td>Report of the Committee on Uniform Standards of the Eastern Live Stock Sanitary Association</td>
<td>174</td>
</tr>
</tbody>
</table>
Statement Concerning Regulations for Shipment of Pure-Bred
Cattle, Sheep, and Swine ........................................... 185

Livestock Importation Problems in the Philippines, by Archibald R. Ward ........................................... 207

Miscellaneous Papers—
The Spread of Disease Through Garbage, by V. A. Moore ....... 185
The Glanders Question in Connecticut, by Frank G. Atwood . 189
Infectious Anemia of the Horse, by Hubert Schmidt .................. 220
Trichinosis, by B. H. Ransom ........................................ 147

BUSINESS SESSIONS.
Proposal for Change in By-Laws ........................................ 232
Election of Officers .................................................. 232
In Memory of Doctor Daniel Elmer Salmon ..................... 232
In Memory of Colonel Albert Dean .............................. 233

REPORTS.
Secretary-Treasurer .................................................. 233
Committee on Finance ............................................... 233
Committee on Legislation ......................................... 238
Committee on Resolutions ........................................... 239
Committee on Extension Work of International Tuberculosis Com-
mision ......................................................................... 240
Committee on Grievances ............................................ 240
Committee on Uniform Regulations for the Control of Foot-and-
Mouth Disease .......................................................... 240
Report of Delegates to American National Live Stock Association
Meeting, Denver, January 20, 21, and 22, 1914 .............. 241
State Live Stock Sanitary Officials—
Kentucky ..................................................................... 242
Louisiana ..................................................................... 242
Montana ...................................................................... 243
Nevada ........................................................................ 243
North Dakota .................................................................. 243
Oregon ........................................................................ 244
Utah ........................................................................... 245
Vermont ...................................................................... 245
Washington .................................................................. 246
West Virginia ............................................................. 246
Wisconsin ....................................................................... 247
Wyoming ....................................................................... 247
OFFICERS—1915

President.
J. I. Gibson, Des Moines, Iowa.

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B. F. Davis, Cheyenne, Wyo.
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W. P. Anderson, Amarillo, Texas.

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John J. Ferguson, Chicago, Ill.

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Legislation.
John R. Mohler, Washington, D. C.
F. A. Ingram, Hartford, Conn.

Credentials.
P. F. Bahnson, Atlanta, Ga.
W. J. Butler, Helena, Mont.
J. R. Underwood, Des Moines, Iowa.

Resolutions.
C. E. Cotton, Minneapolis, Minn.
J. F. de Vine, Goshen, N. Y.
C. M. Haring, Berkeley, Cal.
O. H. Eliason, Madison, Wis.

Program and Publication.
John J. Ferguson, Chicago, Ill.
B. H. Ransom, Washington, D. C.
M. Dorset, Washington, D. C.

Uniform Health Certificate.
J. A. Kiernan, Birmingham, Ala.
Tom Downing, Washington, D. C.
C. M. Haring, Berkeley, Cal.
L. C. Kiernan, Lincoln, Neb.
W. W. Yard, Denver, Colo.
W. N. Waddell, Fort Worth, Texas.
W. P. Anderson, Kansas City, Mo.
C. A. Cary, Auburn, Ala.
A. Joly, Waterville, Maine.

Cattle Tick Eradication.

George White, Nashville, Tenn.
W. H. Dalrymple, Baton Rouge, La.
C. A. Cary, Auburn, Ala.
P. F. Bahn, Atlanta, Ga.
B. K. Kaupp, West Raleigh, N. C.
R. M. Gow, Fayetteville, Ark.
C. F. Dawson, Jacksonville, Fla.
J. H. Avrey, Fort Worth, Texas.

Extension Work of International Tuberculosis Commission.

M. H. Reynolds, St. Anthony Park, Minn.
John R. Mohler, Washington, D. C.
John J. Ferguson, Chicago, Ill.

Uniform Methods for Control of Hog Cholera.

Paul Fischer, Columbus, Ohio.
M. Dorset, Washington, D. C.
A. T. Peters, Peoria, Ill.
A. T. Kinsley, Kansas City, Mo.
W. H. Dalrymple, Baton Rouge, La.

Grievances.

J. W. Connaway, Columbia, Mo.
V. A. Moore, Ithaca, N. Y.

Advisory Committee to the Secretary-Treasurer.

E. Pegram Flower, Baton Rouge, La.
S. H. Ward, St. Paul, Minn.
S. F. Musselman, Frankfort, Ky.

Committee on Diseases.

O. E. Dyson, Springfield, Ill.
A. T. Kinsley, Kansas City, Mo.
John R. Mohler, Washington, D. C.
Constitution and By-Laws

As amended and approved by the Association at the annual meeting, Chicago, 1909.

CONSTITUTION

Section 1. This association shall be known as the "United States Live Stock Sanitary Association."

Section 2. The purpose of this association shall be the study of sanitary science, and the dissemination of information and methods pertaining to the control and eradication of infectious diseases amongst live stock.

Section 3. The officers of this association shall be a President, five Vice-Presidents and a Secretary-Treasurer.

Section 4. The elective officers of the association shall constitute the Executive Committee.

BY-LAWS

Section 1. The duties of the several elective officers shall be those generally performed by such officers in similar organizations.

Section 2. The executive committee shall select the place for the meeting of the Association and execute such other duties as the Association shall direct.

Section 3. The several officers of the Association shall be elected by ballot at each annual meeting, and a majority of all the votes cast shall be necessary to a choice.

Section 4. The standing committees of the Association, in addition to the executive committee, shall be a committee on publication, legislation, finance, credentials and resolutions. They shall each consist of three members who shall be appointed by the President at each annual meeting or as soon thereafter as may be practicable.

Section 5. Any person engaged in live stock sanitary work for Federal, State, Territorial, County or Municipal Governments shall be eligible to membership in this Association, and any other person interested in live stock sanitation may be elected to active membership upon the recommendation of the executive committee and a two-thirds vote of the members present.

Section 6. Each application for membership shall be submitted in writing and shall be referred to the executive committee for consideration and recommendation of the Association.

Section 7. The revenue of this Association shall be derived as follows: Each member shall pay an annual due of one dollar, payable in advance. By the sale of the annual reports of the Association at a
price to be annually fixed by the committee on publication, said annual
report to be copyrighted.

Section 8. Order of Business:—
Roll call.
Reading of minutes.
Unfinished business.
President's address.
Report of Executive Committee.
Reports of Standing Committees.
Reports of Special Committees.
Report of Secretary-Treasurer.
Reading of papers, discussions, etc.
New business.
Election of officers.
Appointment of committees.
Adjournment.

Section 9. The meetings of this Association shall be held annually
at such time and place as may be designated by the executive committee.

Section 10. A suspension of the By-Laws may be made by a two-
thirds majority for the purpose of changing the order of business to
facilitate important business.

Section 11. All proposals for the alteration of the Constitution and
By-Laws shall be submitted in writing, and no alteration shall be acted
upon until it has been referred to the executive committee and presented
anew by them at the next meeting of the Association.
Report of the Proceedings

OF THE

Eighteenth Annual Meeting of the United States
Live Stock Sanitary Association

Hotel LaSalle, Chicago, February 16, 17 and 18, 1915

OPENING SESSION, FEBRUARY SIXTEENTH

The meeting adjourned from 9:30 A. M. was called to
order at 1 P. M. by the President, Dr. S. H. Ward of
Minnesota.

OPENING ADDRESS.
Joseph Hughes, Chicago, Illinois.

Mr. Chairman and Gentlemen: My object was to rather
lengthily address you, but I shall do no more at this time than
to extend to you a warm welcome to this meeting, this belated
Eighteenth Annual Meeting of the United States Live Stock
Sanitary Association. You remember this meeting was sched-
uled to come off some time the latter part of the year, but it
was postponed. Chicago was at that time prepared to wel-
come you, as she has welcomed you in the past, and as she
welcomes you at the present. She hopes to continue this wel-
come in the future. She welcomes you as a great body-of
scientists whose purposes, whose functions in life are con-
cerned in matters of transcendent importance to the great live
stock industry of the nation, and to humanity generally.

The postponement of your meeting was caused by the
appearance of a disease, which while benign in itself, is still
classed as one of the great scourges of the country, chiefly
for the reason that it upsets commercial life and demoralizes
the live stock industry. Few of you here but have had to do
with this disease during the past four months. It has taxed
your ability to combat it. It has brought clashes of authority,
and the discussion which will ensue on this subject will doubt-
less go far toward solving many difficulties, and will doubtless
provide methods by which the disease can be handled and
finally overcome.
Gentlemen, you have before you a program teeming with subjects of a most interesting and varied character. It is my great pleasure to welcome you here to this literary feast, and I have no doubt that as a consequence of your deliberations veterinary literature will receive material and valuable additions, and that the country will be under many obligations to you for the valuable conclusions which you will arrive at.

I would like to be able to acquit myself a little more creditably before you gentlemen, but I really did not think for a minute that my voice would today be in such condition as to speak for any length of time—I did not think it would have strength enough so that I could make myself understood.

I thank you, gentlemen. (Applause.)

Dr. C. M. Haring: Mr. President, Dr. Hughes, and Gentlemen: I appreciate the honor of being invited to respond to this address of welcome, although I keenly realize that the response might have been placed in abler and more experienced hands.

Dr. Hughes has mentioned Chicago as the ideal meeting place for this Association, and recognizing that fact we have usually met here. In fact, when our meetings have been held in other cities it is because of certain special attractions, as for instance, when we met in Washington, D. C., just preceding the International Congress on Tuberculosis. Just now there is a strong pull for our meeting in the far West, and, Mr. President, in this connection I would like to mention a matter which I trust will not be as startling to you as it was to a minister in Iowa.

It seems this man had just been called to the pastorate of a church in a town, and he was asked to preside at the funeral services of a man with whom he was not acquainted, in fact he had not known him nor of him. On this account he was not able to make the usual remarks concerning the good character and the accomplishments of the deceased, and at the end of the service he called upon any one who might be present and cared to make some remarks concerning the good works of this man, to get up and do so. There was an embarrassing silence for several seconds. Finally a man in the back of the room arose and said: "I didn't know the deceased or the bereaved family—in fact I never heard of them until today, but if there is no one else wants to say anything, I would like to seize this opportunity to say something about my chosen State, California." (Laughter.)

Mr. President, I do not wish to seize this opportunity unjustly, but I simply want to mention the fact that we have
been preparing for you out there for a couple of years, and we are ready, and we anticipate that your Executive Committee will decide to hold the next meeting there, and I am sure none of you will regret the fact after you have attended the meeting.

As to the present session, I think we all realize the seriousness of this meeting; that there are officials here on whom great responsibilities rest, and that the discussions at this meeting will be possibly the making or the breaking, not only of the veterinary profession in its standing in this country, but also may change the present system of animal husbandry.

Dr. Hughes, I desire to thank you again for the address of welcome which you have given. (Applause.)

PRESIDENT'S ADDRESS.
S. H. Ward, St. Paul, Minn.

In calling to order the eighteenth meeting it is a pleasure to welcome so many workers from all sections of the continent. During the eleven or twelve years I have been a member, we have seen a steady growth, both in membership and attendance. Much of the present strength and usefulness of the Association has been brought about by the personal energies of your Secretary.

It was, unfortunately, found necessary to postpone the meeting, owing to the prevalence of foot-and-mouth disease, which for the third time in the history of the United States made its appearance early in October, spreading with alarming rapidity in southern Michigan and northern Indiana. Later, the infection was carried to the Union Stock Yards by stockers and feeders and thence into a larger number of states, the spread being aided materially by contaminated hog cholera serum and virus. For a while the situation was most alarming, and it was clearly recognized that only the most heroic measures could stamp out the disease.

The full significance of the situation was realized and it was deemed expedient to postpone our meeting until the situation had cleared up; so that the matter could be discussed by those who had been actively engaged in the work of controlling and suppressing the outbreak, and uniform control measures, if necessary, be adopted by the Association.

In carrying on the good work which has always marked the meetings of the Association, important and far-reaching problems must be discussed, which I trust will be deliberated with care and justice, keeping not only the interests of individuals and localities in mind but those of the entire country.

The industry which we as sanitarians are called upon to protect, represents the greatest in the world; it is not confined to a few shareholders, but to many, and from this industry spring many branches which are necessary for us to keep in touch with.

It is not my purpose to take up your time with any historical review, but shall present for your future consideration a few suggestions which may at some time be given your careful attention.

The originator of this Association—the "tick"—is being rapidly eradicated. When this Association was formed it was not thought the
time would come when concerted action would be taken to relieve those
states of the burden, which interfered so seriously with their develop-
ment and prosperity. The achievement of this desired end is within
sight; few of us can appreciate the stupendous nature of the under-
taking. This Association should work for continued appropriation of
Federal funds whereby the good work may be continued and other states
released from quarantine, which will add still more to the prosperity of
the country. The final eradication of the tick means as much to the
states above the quarantined area as it does to those below. It means
more markets will be thrown open to our pure-bred stock, which must
create an impetus to the breeding industry of all states above the quar-
antined area.

At this time it might be as well to sound a warning to those authori-
ties representing sections within the tick-infested area.

Great care should be taken to prevent the introduction of tubercu-
losis by the importation of pure-bred stock. Tuberculosis is a greater
menace than the tick. In your endeavor to encourage the breeding
industry of your states, due care should be exercised in guarding against
the importation of diseased cattle by young breeders, and by communi-
ties which are progressive enough to realize the advantages of raising
high grade cattle. To do so means disappointment and loss, which will
tend to hold back the development of your cattle industry.

If, therefore, you have no law which will protect your people from
importation of tuberculous cattle, the necessary legislation should be
urged.

Among legislative measures which should be advocated by us are:
The establishment in each state of a central authority for the control
of animal diseases, which authority may to a certain extent be perma-
nent. In such measure should be incorporated the authority to take the
necessary police action in controlling, suppressing and eradicating con-
tagious and infectious diseases.

Compulsory notification to sanitary officers by all persons having
knowledge or suspicion of the existence of any contagious or infectious
disease of animals.

Adequate laws, if not already in force, should be passed by all state
legislatures, making it a gross misdemeanor for any person to pollute
any streams or waters by depositing therein dead animals.

The country is in urgent need of some Federal measure which will
prevent the interstate movement of tuberculous pure-bred animals.
Unless the foundation of our cattle industry can be purified of tubercu-
losis, no hope can be expected of controlling the disease, which must
increase and ultimately bring disaster. Some national scheme must be
adopted which will induce or force the breeder to eradicate tuberculosis
from his herd.

Already too long has the matter been delayed. We have fortified
ourselves with the hope that some method of immunization would
present itself. We have deceived ourselves with the idea that we have
accomplished a great deal when, after one test, we have eliminated the
reactors from a herd.

If progress is to be made in the control of tuberculosis, I believe
the interstate shipment of tuberculin should by act of Congress be
regulated and its sale restricted within each state. The opportunities
for its fraudulent use are many and while we cannot compel honesty,
we can at least remove the temptation to make private and secret
tuberculin tests.
Attention has been directed, through the public press, to the crusade started against vivisection. In fact, court proceedings were taken against scientists with a view of putting a stop to that which must go hand in hand with all research work.

Inasmuch as we have a number of animal diseases of which little or nothing is known as to cause, method of spread, and prevention, it seems desirable that this Association make known the importance of experimental work and oppose legislation limiting the scope of those engaged in research work. In other words, we should lend our endorsement to animal experimentation known as vivisection.

Worthless specific and so-called cures for many of the animal contagious and infectious diseases tend to keep the knowledge of their existence from sanitary authorities and take thousands of dollars annually from the farmer's pocket. The time has passed when we can sit inert and complacently view the advertisements of these nostrums and depend upon the good sense of the people to refuse their acceptance. As an association, it behooves us to wage a continuous warfare upon all worthless remedies.

Two or three years ago it was confidently expected that hog cholera would by this time have been a past recollection, but during the past year it has evidently caused greater losses to the swine industry than ever before. This disease has invaded sections of the country which in the past have been comparatively free, and the losses from the disease brought about by natural infection, by the use of virus and contaminated serum, has been deplorable.

Federal inspection of serum plants is by no means a security, or a guarantee of potent or reliable serum, as evidenced by the large number of outbreaks of foot-and-mouth disease in Illinois, traceable to virus.

In the preparation of hog cholera serum there is an unlimited opportunity for possible and so-called practical abuses, and we are constrained as sanitarians to vouch to every individual and community such safeguards as will insure them all possible protection.

Vaccination cholera, during the past season, has been repeatedly called to our attention, and I am of the opinion that the use of virus should be absolutely forbidden.

The one great obstacle confronting us is the importation of virus. Commercial firms invariably send out virus with serum, and, notwithstanding their denial, make it a point to sell to laymen. Until such time as hog cholera virus is absolutely under the control of Federal and state authorities, the suppression of cholera is impossible. The Minnesota Live Stock Sanitary Board adopted a recommendation as follows:

"Believing the interstate shipment of virus is a serious cause of hog cholera dissemination, be it

"RESOLVED, That we request the United States Department of Agriculture to provide, at an early date, the prohibition of interstate movement of hog cholera virus."

It would seem desirable that similar recommendations be drawn up and forwarded to the United States Department of Agriculture, urging the passage of regulations forbidding the interstate shipment of virus to those states which forbid its sale. While on this subject it is desired that careful consideration should be given to the requirement of several states that "hogs must be immunized by serum and virus not less than thirty days prior to shipment, or with serum alone not more than seven days prior to shipment."

The single treatment often results in abscesses and sloughing, ren-
dering a breeding animal useless for some time. To my mind a most glaring error is committed with the double treatment, and in letting such double-vaccinated animals go forward, for the reason that there must be some danger of their carrying infection.

For some five or six years that we have viewed the manufacture of hog cholera serum, we have been satisfied to look upon it as a specific, setting down unsatisfactory after-results as due to carelessness on the part of the operator or to local conditions. When these factors were above reproach, then we were at a loss for an explanation.

From an extended observation, after viewing the losses from vaccination cholera, blood poisoning, abscesses, the inability of serum to protect more than ten per cent of exposed swine, its lack of value when given animals with a high temperature, I am constrained to think there is yet much to be desired. The value of the treatment must rest on greater security, and better standardization, before the confidence of the farmers in general can be regained.

It is desired that additional research work be done, looking to some method of standardizing serum and if possible the application of a less cumbersome method.

There are, in fact, many problems confronting us in connection with the production and application of hog cholera serum, which experimental workers should find pleasure in solving. In fact, it would seem the United States Department of Agriculture should be approached by recommendations, urging a continuation of research work along these lines.

We should endeavor to bring about uniformity of suppression and control of contagious and infectious diseases of animals. As a means to this end I believe it would be wise to appoint a permanent committee, to be known as the Committee on Control Work. At each annual meeting this Committee could present recommendations for the control of one particular disease, framing what they believe are the steps to be taken by each and the several states. The first step this Committee might take would be the framing of a plan of state control work, which would place this work on a permanent basis, either through the establishment of a Live Stock Sanitary Board or a Department of Agriculture.

The following year a uniform plan of dealing with glanders could follow, and each succeeding year would bring out some intelligent and uniform recommendation for the control of one of the contagious diseases. These recommendations could be forwarded to the Governor of those states which are lacking in legislation, with a request that such measure be recommended by him in his message to the legislature. I am inclined to believe we could also place such recommendations in the hands of agricultural or live stock committees of each state legislature.

These recommendations, together with a syllabus, could be printed and forwarded to sanitary authorities of every state, and to the agricultural press. Having a similar method of control in each state of the Union, better work could be accomplished and our states better served.

Another suggestion is sanitary and preventive measures against those diseases produced by parasites, such as the cysticercus of cattle and swine, also lung worms, which annually cause serious losses. These subjects could well be taken care of by agricultural teachers in the rural schools.

In the branch of domestic science, the matter of home pasteurization of milk and the proper cooking of meats could be given consideration.

I believe a plain, easy circular, covering preventable parasitic and
contagious diseases, issued by the Association, would be readily adopted by the various educational bodies.

In conclusion, we should advocate in public and in private, the conscientious and deliberate conclusions to which we come. We must teach the less informed and rouse to conviction and stir to active co-operation all men. In doing so we should be actuated by no motive or purpose other than to perform conscientiously our duty as sanitarians.

FOOT-AND-MOUTH DISEASE.

A. D. Melvin and J. R. Mohler, Washington, D. C.

Like a bomb from an aeroplane the 1914 outbreak of foot-and-mouth disease was precipitated upon the live stock industry of the United States with almost an explosion-like effect. How it was introduced, or whence it came remains as deep a mystery today as at the beginning of the outbreak, although many suggestive clues have been thoroughly investigated and disproved. Theory after theory has been exploded, and there remain but two lines of investigation to be completed before we exhaust all evidence at present available relative to the introduction of the disease.

It would be useless to go into the history of these negative investigations, but suffice it to say that the Department has traced the possible origin of the disease all the way from imported biological serums and antitoxins to irresponsible stories which indicated that infection had been accidentally brought to this country by Belgian refugees in the vicinity of Niles, or had been intentionally disseminated by men equipped with hypodermic syringes, hoping to interfere with the exportation of meat to the warring countries in Europe.

It seems probable that the first appearance of the disease in this outbreak was among the hogs of a farmer living two miles west of Niles, Michigan, about the middle of August, 1914. These hogs had never been vaccinated for hog cholera, nor fed on milk from any creamery, as the owner separated the milk from his own cows on the premises.

Three possibilities as to the method of their infection have been developed. The first is in connection with the return of the farmer's wife from a visit to New Orleans where her granddaughter had been recently vaccinated against smallpox. This possibility is rather remote, but is nevertheless under investigation at present.

The second is in connection with the purchase by the farmer of merchandise from a Chicago firm, including two pairs of lisle gloves imported from Germany. The paper used in packing and wrapping these goods was thrown into the hog lot about ten days before the hogs began to show the disease which subsequently proved to be foot-and-mouth disease.

The third possibility is in connection with the stealing of chickens from the farm a short time before the appearance of the affection among the hogs. The farmer suspected that the chickens were stolen by foreigners employed in a neighboring tannery, though he has no evidence upon which to base this suspicion. He thought that possibly the disease may have been brought to his premises by one of these suspected men, who might have become contaminated with the virus from some imported article used in the tannery. Diligent inquiry has been made at this tannery, and it is evident that imported hides can
not be even remotely incriminated, as the last importation was made more than eighteen months before the outbreak.

The plausibility of the above suggestion, however, lies in the fact that certain tanning materials are imported in large quantities monthly from Argentine and Japan, where foot-and-mouth disease constantly prevails. These products are brought into the tannery covered with matting or small burlap bags, which articles are frequently taken home by the tannery employees for household purposes. Our investigations along this line are still in progress, but thus far without definite results.

Within two weeks after the first hogs became sick, the disease spread to the cattle on the premises, and simultaneously the cattle belonging to a neighbor developed peculiar symptoms. Each of the farmers called in a different local practitioner, one of whom several days later notified the State authorities of the conditions present, and requested assistance. The first information that reached Washington was a telegram from an assistant inspector at Detroit on September 3, stating he intended to visit Niles, Michigan, to investigate a possible outbreak of aphthous fever at the request of the State Veterinarian. The following day a telegram was received stating that there was no foot-and-mouth disease in Niles, Michigan. Characteristic lesions of necrotic stomatitis present. On September 4 a letter confirming the telegram was sent to Washington, which contained a very good description of the retrogressive character of the pathological lesions in the two herds of cattle, but this description could be applied to a number of conditions in no way related to foot-and-mouth disease. It was stated that the ulcers had been replaced by new tissue, and the external ulcers about the lips and feet exhibited the scab formation characteristic of lip-and-leg ulceration with new epithelium replacing the granulating surfaces. Not a suspicion was incorporated in either telegram or letter. Had more attention been given to the history of the disease, and less consideration given to pathological phraseology, or had the statements been made of existing conditions to the effect that 50 of the 50 cows in one herd, and 20 of the 21 cattle in the other herd were affected with these peculiar lesions, some suggestion of the character of the infection would have been implied.

Nothing further was heard from the disease in Michigan until the afternoon of October 10, when a letter arrived from the inspector in charge of the Detroit force, to the effect that the disease had spread during the interval from the original two herds to six additional herds in the neighborhood. While this letter contained reasons why the lesions resembled foot-and-mouth disease, and other reasons why they did not nevertheless the history of the various herds was so completely described that no affection other than foot-and-mouth disease could suggest itself. Therefore, Dr. Eichhorn was sent on the next train to investigate and report. The three specimens from the lesions of the affected animals, forwarded in glycerine, were turned over to Dr. Mohler, who immediately proceeded to the experiment station at Bethesda, Maryland, and that evening inoculated three calves, each receiving an intravenous injection, as well as inoculation of the dental pad. On October 12, Dr. Eichhorn wired: "Clinical diagnosis positive. Advisable Mohler leave tonight via Buffalo directly to Niles." The following reply was sent by Dr. Melvin. "Calves inoculated with Schaffter specimens being closely observed by Mohler. If don't develop symptoms next forty-eight hours Mohler will leave for Niles. You should
inoculate calf to confirm diagnosis.” On the same date, October 12, the state veterinarian of Michigan was sent the following telegram: ‘Advisable that farms where animals now show symptoms of foot-and-mouth disease be placed in temporary quarantine until time for the experiments on other animals.” As inoculated calves showed no lesions within the forty-eight hours mentioned, Dr. Mohler was directed to proceed to Niles to confirm the diagnosis, and took with him Dr. Houck who was to be left in charge of the eradication work, as well as Drs. Gallagher and Smith of Washington. They arrived at Niles at 6:30 p. m. on October 15, and immediately were piloted by Dr. Eichhorn in an automobile to see some of the infected animals. By means of a pocket flashlight, the lesions of the natural cases, as well as the calf which Dr. Eichhorn had inoculated in the meantime, were examined, and the following night-telegram was immediately sent by Mohler to Washington: “Lesions of inoculated calf slight but typical. Examined tonight number infected cattle. Indisputably European disease. Reports just received indicate 39 Michigan farms infected. Seven in Indiana. Need fifteen additional men.” Thus the campaign of eradication was launched.

That the glycerinated specimens were reduced in virulence was evident by the results of inoculation at Washington, for while the Eichhorn calf with only a scarified dental pad developed lesions of the disease in three days, the infection in the first Washington calf had a period of incubation of seven days, the second case nine days, while the third calf never developed any symptoms whatsoever. In this connection it should be remembered that the intravenous inoculation of foot-and-mouth disease virus is supposed to be the most rapid and certain method of inoculation with a period of incubation of from six hours to five days. The virus of the disease at the beginning was evidently low in virulence, and the dissemination of the infection was consequently very slow as indicated by the small number of herds to which the disease had spread from August to October.

During the forty-eight hours following the confirmation of the diagnosis, much scouting was done to ascertain approximately the boundaries of the infection, and as a result the Secretary of Agriculture issued an order on October 19 quarantining Berrien and Cass counties, Michigan, and Laporte and St. Joseph counties, Indiana. In the meantime, the co-operation with the State authorities was affected, and measures instituted for tracing, checking and stamping out the disease. While the quarantined territory was believed at first to circumscribe the centers of infection in that section, the disquieting information was disclosed that a mixed shipment containing 28 hogs, 3 cows and 54 sheep had been sent on October 6 from the vicinity of Niles to Chicago. Almost simultaneously it was discovered that the milk from an infected herd had been taken to a creamery daily for the previous two weeks, and the return of the infected skimmed milk to the patrons of this creamery resulted in the rapid spread and almost spontaneous appearance of the disease on thirty-six farms, which number increased to over one hundred before the creamery could be closed. The hogs in the Chicago shipment were among the first to receive this contaminated skimmed milk, and their shipment to Chicago before the development of the disease probably infected the cows and sheep in the car as well as the Union Stock Yards of Chicago. From this point infection was carried by various shipments of live stock, especially the classes of
cattle known as stockers and feeders from the Chicago stock yards to various parts of the country north, east, south and west.

About this time the products of a certain hog cholera serum company in Chicago became infected with the virus of foot-and-mouth disease. A careful investigation developed the fact that no serum shipped out from the plant of this company was contaminated with foot-and-mouth disease. One lot of virus, however, was so contaminated. This lot of virus was comparatively small, it being composed of 3400 c.c. of blood obtained from four pigs. These pigs were not purchased sick in the stock yards, but were well at the time they entered the establishment on October 16. They were then inoculated with hog cholera virus with the intention of using their blood in connection with administering the serum-simultaneous treatment. On October 26, these hogs were killed to furnish hog cholera virus.

The lesions found in these four pigs were only those of acute hog cholera, but evidently they were also in the incubative stage of foot-and-mouth disease. It is a well-known fact that the virus of foot-and-mouth disease is present in the blood only in diluted quantities and then only at the beginning of the fever, before the vesicular eruptions appear. The blood will carry the virus of foot-and-mouth disease without possibility of detection except by animal inoculations, when the hogs are killed at this stage. The blood from these pigs was mixed and most of it was shipped out to customers of the concern in Ohio, Indiana, Illinois and Iowa. On November 3, the inspector in charge of the plant had his suspicions aroused by sickness appearing in certain hyper-immunized hogs. This was late in the day and he visited the plant at daylight on November 4. He immediately quarantined the plant for foot-and-mouth disease, because the hogs noticed sick the evening before were worse and showed lesions of foot-and-mouth disease. All of the employees and the entire establishment were disinfected, and the plant still remains under quarantine. The infection of the plant was due either to the promiscuous passing of the owners and employees of the company to and from the infected Chicago stock yards, or to the purchase of hogs exposed in the yards.

The disease has so far been found in the following twenty states, namely: Connecticut, Delaware, Indiana, Iowa, Illinois, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Montana, New Jersey, New Hampshire, New York, Ohio, Pennsylvania, Rhode Island, Virginia, Washington and Wisconsin; in addition, two herds were found infected in the District of Columbia. The Secretary of Agriculture has quarantined all or portions of each of these states, and local quarantines have been imposed by the State authorities.

As an illustration of the manner in which the disease was disseminated, it may be interesting to refer to the feeders which went from Chicago to Montana, a very unusual occurrence, and were held up at Glendive, Montana, on account of showing symptoms of foot-and-mouth disease. These cattle had passed through several public stock yards enroute, and before it was known that they had become infected, a shipment of dairy cattle from clean territory in Wisconsin was unloaded for feed, rest and water in the contaminated yards. When the dairy cattle reached Spokane, Washington, the disease manifested itself, and the cows as well as the pens where they were yarded were cremated without giving rise to any secondary centers of infection.

Since the reinfection of the Chicago yards during the middle of January, another consignment of twenty-six dairy cows from clean
farms and free territory in Wisconsin has likewise carried infection to a distant point, but the state infected was Kansas. These cows were held outside the Chicago stock yards for thirty-four hours owing to the failure of the owner to request a health certificate from Dr. Eliason. While the mails were carrying the correspondence to and fro, the owner of the cattle visited the Union Stock Yards, and evidently carried the virus back to his Holstein cows. When they arrived at their destination the herd was divided and placed on two farms. About eight days later symptoms of foot-and-mouth disease developed, causing four counties in Kansas to be placed under quarantine as recently as February 1.

Instances of this nature, showing the intensely infectious character of the disease, could be recorded indefinitely, but the feature will probably be dwelt upon by some of the other speakers this afternoon.

The first three outbreaks, in 1870 in western Massachusetts and eastern New York, about 1880 in several lots of imported animals, and in 1884 in the vicinity of the quarantine station at Portland, Maine, were comparatively insignificant; those in 1902 and 1908 were more grave; while the present infection is by far the most serious and extensive of all.

The type of the disease in 1870 appears to have been quite mild, which together with the restricted movement of both live stock and persons which obtained at that time, accounts for its failure to become more disseminated.

The other outbreaks in the 80's were likewise mild, and restricted to only a few herds, so that the dissemination of the virus was quite easily controlled.

In the 1902 outbreak, cases were found on 205 premises in twelve counties of four states, while in the 1908 outbreak the infection was located on 157 premises, distributed over a much larger territory comprising twenty-three counties in four states. However, a larger number of animals were slaughtered during the former outbreak, namely, 4,461 against 3,636 in 1908. This latter outbreak was also a much greater menace to the live stock interests of the country, as it reached as far west as Michigan, and came closer to the great stock-raising region. The present outbreak has reached this region, and native range cattle have contracted the disease in Montana, but fortunately only three known infected herds now exist west of the Mississippi river.

The vastness of the prevailing outbreak as compared to other visitations may be realized from the following table, which shows that already 2,245 premises have become infected in 223 counties of twenty states and the District of Columbia. These figures mean little, except by comparison, and for this reason it is thought desirable to show the proportion of infected farms and infected live stock to the total number of farms and live stock in one of the most extensively infected states. For purposes of illustration, it may be stated that in Illinois 19,630 cattle out of approximately 2,233,000 cattle have become infected, 24,165 hogs out of probably 4,350,000 hogs, and but 535 sheep out of a total of 935,000 sheep. Of the 150,000 farms in that state, only 568 have been involved. Thus far the number of cattle destroyed in all the states is 32,914, which is less than .08 of 1 per cent of the total number in the United States. In other words, the number of cattle destroyed does not exceed the number killed in two or three days in some of the larger packing-house centers.
### STATEMENT SHOWING PROGRESS OF WORK OF ERADICATION OF FOOT-AND-MOUTH DISEASE, FEBRUARY 9, 1915.

<table>
<thead>
<tr>
<th>State</th>
<th>No. of entire State</th>
<th>No. of counties</th>
<th>No. of premises</th>
<th>No. of animals infected</th>
<th>No. of animals recovered</th>
<th>No. of premises disinfected</th>
<th>No. of animals disinfected</th>
<th>No. of animals destroyed</th>
<th>Remarks</th>
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<td>2</td>
<td>24</td>
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<td>22</td>
<td>49</td>
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<tr>
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<td>2</td>
<td>23</td>
<td>56</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>28</td>
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<td>0</td>
<td>48</td>
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<td>308</td>
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<td>102</td>
<td>Do</td>
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<td>1</td>
<td>4,410</td>
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*Number of counties in each State given in order to show approximate area of State involved.

An analogy may be shown between these last three outbreaks. They all started about August or September, with intervals of six years. They were not uncovered in the 1902 or 1908 outbreak until November. In this present visitation the disease was diagnosed about the middle of October, a month earlier than in the two previous outbreaks. The success which followed the eradication of the disease in these two latter outbreaks through slaughter of infected herds, enforcement of rigid quarantine measures, and the prompt and thorough cleaning and disinfection of the infected premises in co-operation with the state authorities, has been generally recognized as the most practical and efficient means of eradication that could be adopted in this country, and such measures have been employed successfully in Denmark, Norway, Sweden, Holland, England and other European countries, as well as Australia. Even in Germany this course was followed for a time in a recent outbreak, but the spread of the disease was so rapid—possibly because of its former widespread appearance in that country—that it soon got beyond the control of the authorities and the slaughter of the infected herds had to be abandoned. The experience gained in those countries where foot-and-mouth disease has become so prevalent and permanently implanted has shown that the existence of such an intensely contagious malady in a country is a constant menace to the livestock industry, and its control solely by quarantine measures and...
disinfection has proved impossible in those countries where it has been undertaken.

In considering the losses from this disease, the mortality is not the only factor to be mentioned. The death rate in the benign form of the malady may be only 3 per cent, while in the malignant form of the disease it may reach from 30 to 40 per cent and even more of the affected animals. On the other hand, the mortality among calves in the benign form of the infection is considerable.

Although as a rule infected animals respond quickly to medicinal treatment, the Department does not advise such treatment of animals suffering with foot-and-mouth disease. If diseased animals were held for treatment, they would be a source of infection for some weeks or months, and if this plan were generally followed we should probably never be able to get rid of the disease. The malady is of such a highly contagious character, and the infection is so easily spread, that during the period of treatment one animal might communicate it to hundreds of others. Experience in European countries has shown the futility of attempting to eradicate the disease by curing individual animals. The affected animals that have passed through the disease become a source of further infection as virus carriers for weeks and months, even after they have apparently recovered, and are susceptible to reinfection as one attack does not confer permanent immunity.

It is a known fact that many of the infectious diseases of man such as typhoid fever, cholera, plague and diphtheria are spread by so-called bacillus or virus carriers. Such carriers may also occur in different diseases of animals, although definite data on virus carriers in animals have been established only in foot-and-mouth disease, Malta fever, and equine influenza. The possibility of such carriers existing in other diseases of animals such as hog-cholera has been intimated by Hutyra and other prominent authorities. The occurrence of virus carriers after the recovery of foot-and-mouth disease was first recognized by Loeffler in 1904, and is of special importance in countries where eradication is conducted with only quarantine and veterinary police measures.

The absolute solution of this problem causes many difficulties, because in foot-and-mouth disease, unlike in typhoid fever or diphtheria, the infective agent can not be determined bacteriologically, since in foot-and-mouth diseases we have to deal with an ultra-visible virus.

In 1905, Nevermann pointed out in an official report that an animal recovered from foot-and-mouth disease introduced the infection to another herd after a lapse of eight months. Later, the Ministry of Wurtemburg reported two cases in 1907 in which recovered animals acting as virus carriers transmitted the disease. Further, Loeffler mentioned similar cases, and in his report suggested that all animals which are used for experimental work on foot-and-mouth disease should be slaughtered after the conclusion of the experiment. Again, at the Ninth International Veterinary Congress, Loeffler and Nevermann reported further observations on virus carriers of foot-and-mouth disease. The conclusions of Prof. Loeffler are as follows:

Regular supervision of such farms is indispensably required.

One of the most important results of the researches concerning foot-and-mouth disease is that the fact has been doubtlessly ascertained that, just as in numerous human infectious diseases, some of the recovered animals will remain carriers and continue the spreading of the virus.

It seems that the number of such animals is limited.
How long such animals can spread the virus has not yet been ascertained. According to the experience gathered up to the present moment, even seven months after the end of the epizootic new infections have been caused by them.

As yet no method is known to discriminate the virus spreaders.

Infected animals are to be placed under observation during at least seven months. They must not be offered for sale, and should be kept separated from healthy animals.

Nevermann, in his report on foot-and-mouth disease prepared for the Tenth International Veterinary Congress held in London in 1914, attached great importance to the virus carriers in connection with the spread of this infection. He claimed that in the control of foot-and-mouth disease, it is absolutely necessary to give the so-called virus carriers due consideration, as otherwise the results of the measures inaugurated for the eradication of the disease may prove fruitless. He also cited numerous instances in which virus carriers were indisputably the propagators of the disease. Such observations have been made, especially during the last outbreaks in Germany, which afforded the authorities a splendid opportunity for collecting data on this phase of the disease. All the governmental veterinarians received instructions to make close observations relative to each outbreak with a view to tracing its origin. Special reports were required in all instances where the disease could be traced to virus carriers. As a result of these steps, Nevermann was in a position to publish in the last annual report of the veterinary officers of Prussia over one hundred outbreaks reported from different parts of the country in which virus carriers were apparently responsible for the dissemination of the disease. Naturally it was impossible to establish with positive certainty that in each instance the virus carriers spread the disease, or that other factors might not have been responsible for the outbreaks; nevertheless, in considering the large number of outbreaks reported to be due to such a source of infection, we must accept that the careful observations of the district veterinarians include only such cases as were obviously traceable to virus carriers. The outbreaks in which the infection occurs after the lapse of a prolonged period following the recovery of infected animals may be divided into two groups: The first group would embrace these cases in which susceptible animals are placed in previously infected stables and subsequently become infected—in such cases it might be possible that the virus was still present in some remote places not reached by the disinfectant, the newly introduced animals contracting the disease from such a source. The second group would include the cases in which recovered animals after the disappearance of the disease are introduced into healthy herds, thus infecting them. In these cases the disease usually appears among the animals of the healthy herd only after several weeks, and at times even after months. At the same time, the animals which brought the infection into the herd do not become infected. Investigations which have been conducted in order to determine what part of the recovered animal harbors the infection have not been uniform in their results. Some investigators have found that the saliva of a recovered animal was responsible for the spread of disease. In other cases, the virus is supposed to have been spread from the crevices in the hoof. The recent studies of Zschokke are particularly interesting on this phase of the subject. He undertook the work of establishing to what extent the feet of recovered animals
may be responsible for the dissemination of disease, and according to his findings, the vesicles which occur in the skin of the interdigital spaces and the plantar cushion may also extend under the horny capsule forming their furrow-like spaces along the sensitive laminae of the wall and sole, and he also found hidden vesicles in the hoof which did not open to the outside. It therefore appears possible that virulent lymph which is present in these locations penetrates between the horny structure where it becomes enclosed until it is brought to the surface by the natural wearing of the hoof, and is then responsible for the transmission of the disease. The findings of Zschokke would explain the possibility of the occurrence of the disease in localities in which animals harboring the virus in such fashion are introduced into healthy herds, and it is considered possible that the greatest proportion of the virus carriers harbor the infection in this manner. In countries where the eradication of foot-and-mouth disease is conducted by the enforcement of quarantine measures, these so-called virus carriers must therefore be a constant menace to the elimination of the disease, and if for no other reason than this, it appears that whenever the circumstances permit, eradication of the disease should be carried out by slaughtering the infected herd. The fact that recovered animals might transmit the disease for six or seven months to susceptible animals would cause a constant uncertainty, and require a vigilance impossible of enforcement.

In order to demonstrate the extent of the spread of this disease in Germany, and to demonstrate the advisability of controlling the disease by the slaughter of the infected herds in connection with sanitary and quarantine measures, authentic statistical data are given below.

The outbreak which appeared in Germany in 1888 reached its height in 1892, when 1,304,299 cattle, 2,193,187 sheep, and 4,238,262 hogs were affected with the disease. It gradually diminished after this time, but again reached very great proportions in 1899, when 1,885,774 cattle, 1,505,830 sheep, and 814,862 hogs were affected. After that time the disease gradually diminished, although it continued to exist to a greater or less extent. In 1910 it appeared to gain in virulence, and in 1911 the affection was more widely spread than ever before in the history of that country. In that year 3,366,369 cattle, 1,602,627 sheep, 53,674 goats, and 2,555,371 hogs were affected with the disease. Similar statistics could be cited from other European countries in which the policy adopted consisted in endeavors to control the disease by quarantine measures.

The prevention of such widespread epizootics among domestic animals must of necessity have a great influence upon the animal industry of the country. The losses which may be attributed to the disease, outside of the mortality, are heavy. These include the rapid loss in the condition of the animals, especially in fattened stock; the diminution in the milk yield of dairy cows, and the subsequent appearance of garget in a considerable proportion of the affected animals, with a total destruction of milk secretion in one or more quarters of the udder; likewise, abortions frequently occur in pregnant animals, as well as other complications which are associated with outbreaks of this disease. Furthermore, feet complications are particularly frequent in fat stock and hogs, which not infrequently result in the sloughing of the hoofs.

Various authorities have aimed to establish the depreciation in value of an animal after an attack of foot-and-mouth disease. An English practitioner of wide experience states that it is none too high to place the loss on each animal that becomes affected and that ultimately recovers at $20 when milch cows or feeding cattle that are nearly finished
are under consideration. Other eminent authorities state that the deterioration will amount to from 20 to 30 per cent of the value of animals. In Denmark it is figured that the depreciation in value would amount to $8 per head, in Germany $7, and in Holland $10. Allowing the smallest figures to stand as the average, and considering that there are in the United States about 58,000,000 cattle, of which only 50 per cent might become infected, the losses sustained for cattle alone would amount to over $200,000,000, to make no allowance for injury done to swine, sheep, goats and other susceptible animals.

The paralyzing effect upon the traffic in live stock which results from the outbreak, and necessary quarantine which must be established to control the disease, and which must extend over a long period, must also be considerable from an economical standpoint during the prevalence of the contagion. For instance the disease causes the closure of markets and the prevention of fairs, shows and public sales, interferes with the proper supply of milk and meat, and prevents the exportation of live stock. States not infected refuse admission of animals from the quarantined states, and owners of herds free from disease naturally demand protection from exposed or infected stock. In view of these circumstances it is not surprising that those who have seriously taken part in the struggle against this disease sooner or later possess the conviction that success is to be expected only from energy and resoluteness.

In the previous outbreaks of 1902 and 1905, the expenditure of the United States Government in the eradication of the disease amounted to about $300,000 in each instance. Between the three outbreaks, including the present one, there were six-year intervals, and by distributing this expenditure over the intervening period the total amount per year would be only $50,000, which is very small when compared with the losses which would result if the disease had been allowed to spread over a considerable area of the country.

Experience with the disease in various countries indicates that once the infection has been allowed to spread over large areas, the contagion practically had to wear itself out before it subsides. But even then the virus will remain dormant only during the period of acquired immunity of the animals. A reduced resistance in the animals will again afford an opportunity for the virus to assert its infective action, and outbreaks will start anew with increased force. These facts probably account for the periodical curves which are noted in the presence of the disease throughout continental Europe, and if it were possible for the respective governments to adopt measures by which they could eradicate the disease they would gladly make the financial sacrifices which it would be necessary to incur through the slaughter of infected and exposed animals in newly appearing outbreaks.

In consideration of the above facts, we can readily see the advantages of eradicating the disease by the slaughter and burial of all exposed and affected animals, enforcement of rigid Federal and State quarantine measures and thorough and prompt cleaning and disinfection of the infected premises, and the experience gained in the former outbreaks substantiates the belief that this is the only effective procedure in the controlling of the disease in this country.

In Europe until a comparatively recent date, the disease has been combated by isolation and quarantine, and the cleaning and disinfection of infected premises, but these measures have not been effective, as is shown by the continuous existence and the wide dissemination of the infection. The results of combating the disease without the slaughter
of infected and exposed animals is shown by the statements of Professor Dammann of Hanover, who said that without absolute quarantine of the infected farms, preventing even the movement of persons, the control of foot-and-mouth disease is impossible; but this stringent measure, he states, cannot be executed in eradicating the disease, and notwithstanding the quarantine of infected stables, reinforced in many instances by the quarantine of communities, and often by a large zone around these communities, and further, the very extended prohibition of animal traffic and the supervision exercised over abattoirs, dealers' stables, and railroad cars, the disease continued to prevail.

Professor Loeffler of Germany says that foot-and-mouth disease is spread more and more every year and every year it costs the German Empire enormous sums. Necessary measures have been taken with the greatest care, suspected premises have been closely quarantined, and these measures have been extended to whole communities, and even to entire districts, but notwithstanding that the disinfection had been carefully carried out, the disease kept spreading.

In regard to the slaughter of infected and exposed animals as one of the measures in the eradication of the disease, Professor Hess of Switzerland has concluded that in order to cope with the disease "the diseased animals should be destroyed completely, including hides and hair, and the exposed animals slaughtered under police supervision."

In England slaughter has been resorted to quite frequently in recent years to stamp out the disease when first introduced. Dr. Cope, speaking of the outbreak in that country while he was the chief veterinary official, said: "It was eventually stamped out in the County of Kent by the purchase, slaughter and burial of several of the affected flocks."

Dr. Fleming of England, speaking of the outbreak in Australia, said: "There was really only one outbreak in Victoria among the cattle on two farms into which it had been introduced by an imported bull. Here the cattle were destroyed and with them the disease."

Dr. Cope refers to a communication which he received from Dr. Bang of Copenhagen, in which Dr. Bang says: "Since 1876 we have had every year, once or twice, cases of foot-and-mouth disease; in all cases we killed the cattle, sheep and swine on the farms even if only one calf was affected." Dr. Cope stated at the International Veterinary Congress at Baden-Baden in 1899: "We have now been free from the disease since 1894, and I can assert that at the present time foot-and-mouth disease is more dreaded by farmers and stock owners of Great Britain than cattle plague or pleuro-pneumonia, and they are willing to put up with whatever restrictions of however drastic a character considered necessary by the central department to stamp it out."

Remmelts, in referring to the struggle against foot-and-mouth disease in the Netherlands, mentions in his report to the International Veterinary Congress at London in 1914 that "preference must by far be given to the immediate removal of virus by slaughtering diseased and suspected animals than to any other measure." By adopting such methods the extermination of existing, as well as the suppression of new virus carriers is accomplished. In his article special stress is laid upon the necessity of properly pasteurizing all by-products of the creameries, including whey, and of stopping the movement of cattle in the infected district.

Mettam, at the same Congress, gave his experience with the disease in Ireland and stated that the animals, both infected and exposed, are slaughtered and their carcasses burned or destroyed without any attempt
to salvage any portion of the animal, owing to the danger of spreading
the virus far and wide.

Professor Leclainche, a representative of the French Government at
this Congress, likewise advocated the slaughter of diseased and exposed
animals in countries where the infection has not become firmly im-
planted, where natural boundaries are present, or when the disease
occurs in the benign form.

The above quotations are sufficient to show that the slaughter of
diseased animals has been frequently adopted as a means of combatting
the disease in Europe, and it has been more successful than any other
measure. In fact, the International Veterinary Congress held at Baden-
Baden in 1899, stated in one of its resolutions passed with reference to
this disease, that it was necessary to authorize slaughter and to estab-
lish uniform sanitary regulations in order to arrest and eradicate this
burdensome plague.

FOOT-AND-MOUTH CONDITIONS IN VARIOUS
STATES.

Connecticut.

Dr. Frank A. Ingram: Mr. President and Gentlemen: It is very easy by looking at the map, to get the condition of
affairs as they exist in the first state on the list. We received
our contamination from a shipment of cattle from the Brighton
Stock Yards, I think, on the third of November, and it was
discovered in Connecticut on the 14th of November. On the
12th of December the entire number which the state contained
were slaughtered and buried, and the premises were being
disinfectcd, at a total cost of less than $23,000. We consider
ourselves very fortunate in thus easily getting the disease
under control. We were assisted by a Federal force of five
inspectors, and the inspector in charge. In each and every
case the state furnished man for man and an inspector, to as-
sist in every way possible the Federal force. We think we have
accomplished very good results. Our neighbor, Massachu-
setts, from which we received our first contamination, has not
been as successfully cleaned up, inasmuch as last week we had
reported a few new herds in which the disease had broken out.
I think, gentlemen, that is all that I have to say in respect to
conditions in our state.

Delaware.

Dr. F. P. Eves: Mr. President, on the 6th of November
I was called on a private call to see a steer that had been
received in a lot of steers from Lancaster, Pa. Not suspecting
foot-and-mouth disease I was not in condition to examine the
steer, but nevertheless I did examine the steer, and as I found
it had foot-and-mouth disease I immediately got in my

27
machine and went home and changed my clothing, and that was the last visit I made that day. The steers were shipped from Lancaster on the third of November, I think on election day. I was called on the sixth. It took all the intervening days between the 6th and the 11th to make arrangements with regard to the slaughter; to get into communication with the Federal authorities and to make arrangements with the state authorities. As I say, on November 6th the disease was discovered, and on November 11th I slaughtered, and November 23rd was the date of disinfection. Delaware's share in the loss of that herd was $596.63.

In that particular car there were three consignments. One consignment consisted of twelve steers and two heifers. Another consignment consisted of five steers, and another of six steers. Five of the steers came from West Virginia, and the remainder of the car load came from Indiana. In the shipment from Lancaster to Delaware the consignment of five steers from West Virginia was in the car with the remainder of the steers from Indiana, and I might state that the five steers in the car did not contract the disease. They were very carefully watched, and kept under quarantine for, I might say, two months, and then released. There were no signs whatever of the disease among them.

Case number two was two steers that were shipped in that car-load, and the discovery of the foot-and-mouth disease was made on the 12th, at least the discovery of the symptoms was made on the 12th. On the 13th they were slaughtered, and disinfection occurred on the 24th. The total loss to the State of Delaware in that case was $266.20; twenty-eight head, including the animals on the farm at the time of the arrival of the steers, in which were included twenty-two head of sheep. I might say that out of the twenty-two head of sheep which ran the field with the steers, we found eight had contracted the disease.

Case number three came from another source. In a little town called Hockessin a pork butcher received a car-load of hogs, which were unloaded on election day, the same day that the steers came. We did not hear anything from it until the 13th of November. We discovered the disease in three cows that had been pasturing close to the station, across the road from the house. The hogs had been driven from the station to the butcher's farm over the road, and the cows were driven daily across the road to the pasture field in front of the house, and they contracted the disease in that way, we think.
disease was discovered among them on the 13th, and they were killed and buried on the 13th.

Case number four was from another source of infection, that we cannot trace. Three cows and two hogs were involved. The premises on which this stock was kept runs down to the B. & O. Railroad, to a siding where some of the cars are sometimes cleaned, the manure unloaded, and the cars disinfected. The owner of that stock thinks that probably that is the way the disease was contracted, by the stock coming in contact with some of the refuse from these cars.

Case number five is the case of the hogs that were shipped to the pork butcher at Hockessin. On our first visit to number three, which was the cows that contracted the disease from these hogs, we found one cow that we considered suspicious. She simply had a little ulcer on the pad. Looking over all the other cows we found nothing. On the next day, the 15th, we went back and found five or six cows decidedly infected, and on the 17th the entire herd was under the ground.

Case number six was that of a farmer, a neighbor to number one. Now number one, you understand, was discovered on the 6th, and number six, after thorough inspection of the farm, was not discovered until the 16th. In spite of guards and all precautions taken, on this farm, which was only a quarter of a mile distant from number one farm, the entire herd of eighteen animals was infected. In that case the disease was discovered on the 16th, and the animals were under the ground on the 17th. The total expense to the State was $424.

Case number seven was a shipment of hogs to a pork butcher from another source. I might state that all these hogs came from the State of Ohio, through Baltimore. They were discovered on the 17th, and the animals were under the ground on the 19th. The total loss to the State of Delaware was $582; nineteen animals destroyed.

Case number eight was the case of another pork butcher whose hogs came with those of the last one mentioned. They were discovered on the 19th, and were under the ground on the 19th.

Case number nine is that of a farmer who is a neighbor of number five. His herd consisted of twenty head of cattle. His farm adjoined the pork butcher who received the hogs from Ohio. The case of the hog butcher was discovered on the 14th, and that of the farmer on the 19th. In the latter case the cattle were destroyed and buried on the 20th, twenty head of cattle. The total loss to the State of Delaware was $530.50.
Case number ten was that of another hog butcher whose hogs came with number eight. We there discovered one cow that had contracted the disease from the hogs. The hogs had all been slaughtered and sold before we knew that the hogs had been received there, but the cow in a stable adjoining the slaughter house was discovered to have foot-and-mouth disease on the 21st, and she went under the ground on the 21st.

Case number eleven was that of a farmer adjacent to a neighbor of the Hockessin pork butcher. We discovered that case on the 3rd of December, and the animals were under the ground on the 4th of December. Nine animals, with a loss of $160.75 to the State.

Case number twelve, which was five miles distant from any other outbreak was discovered on the 17th of December, and there we found fifty-one head suffering from the disease. That was the very, very worst outbreak that we had. This case was without any history of exposure whatever, excepting that some cattle dealers passing from one section to the other might have gotten there before the other cases were discovered.

We lost in all 223 head of cattle, hogs and sheep, and to do the work we had seven veterinarians of the state, and three to four Federal inspectors. I might state that we received very courteous attention from the Federal inspectors, and that they did very rapid work. Our state veterinarians were also on the job. The total loss to the State in this outbreak was $14,595.65. That was the State's share.

Indiana.

Dr. Bolser: Mr. Chairman and Gentlemen: I am very sorry that Dr. Houck because of his severe cold is not able to tell you of the work we did in Indiana. I will not undertake to enumerate the herds or the outbreaks in the State of Indiana. We were right up against the center of things, and in one township in St. Joe County, the north township in that county, near the Indiana State line, we had thirty-six herds break, so you see it would not be worth while to enumerate the different herds that broke in Indiana. We endeavored to co-operate with the Federal authorities to the best of our ability. We endeavored to get our herds under the ground as quickly as possible. During this time we had a great many things to contend with. We were compelled to educate our people as to what had to be done. They had not dealt with foot-and-mouth disease in the past.

Taking the great number of cars of cattle, hogs and sheep—cattle and sheep especially—that came out of the Chicago
yards from the first day of September to about the first day of November, it required a great deal of earnest effort to get to those cattle and to those sheep to determine whether they had infection or not. Understand, our infection was brought to us by contact with those animals that became infected in the several counties of Michigan, by the shipments from the infected virus. Hence we had three sources of infection to contend with.

I can say that the loss to Indiana through this disease was $200,000. I can say to you gentlemen, that we have it absolutely under control in our state. Of course we are constantly kept at work with the shipments. We had a shipment only last week that had infected hogs, coming from Louisville, Ky. Week before last we traced a shipment coming out of the Chicago Stock Yards about the 16th of January. And these shipments from these various yards and in these various lots are keeping us very busy. You understand that once in a while a state official will take it for granted that yards have been thoroughly disinfected. We have had two instances of infection where native animals were allowed to go into yards where infected shipments had been received. But that will not happen again.

I want to assure you that while the loss has been very great to the people that had the infection, to the stock owners and raisers of cattle in Indiana because of the quarantine that we were compelled to impose—and we have enforced a very rigid quarantine—yet we have had the active and whole-hearted co-operation of our people in this work, the railroad people and the stock men, and we have had the co-operation of the health officials and others in Indiana in this work, and we are very well satisfied with the conditions now, although we are very, very sorry that so great a loss was occasioned through this disease.

Iowa.

Dr. Gibson: Mr. President and Gentlemen: I will not go into any details concerning the small outbreak in Iowa. I will say to you that it amounts to about three per cent of the livestock values of one county, so we feel that we have escaped very luckily from what might have been a very expensive outbreak.

We had six original shipments from the Chicago yards carrying the infection. We had one outbreak that we believe came from the use of infected virus. I have not been near enough to see the figures on this map, but our latest figures
on the total appraisal is about $118,500, with one herd yet to be appraised; and about $10,000 for burial and disinfection expenses, and about $20,000 for state services.

From the first we have co-operated to the fullest extent with the Federal authorities. In every step of the work we have asked “What do you suggest here, and what do you suggest there,” and we feel everlastingly indebted to the Federal authorities for the splendid work they have done in the State of Iowa. And were we deprived of their assistance and support, I assure you, gentlemen, that we would feel somewhat nervous. But I somehow, looking back over the past record made by the Federal authorities in controlling this disease, have felt secure all the while that a complete eradication of this outbreak would result from the co-operation of the state departments with the Federal authorities.

This outbreak struck us when our meat harvest was ripe. Of course we ship some meat every day in the year, but at this particular time our best meat products, our Christmas beef and our heavy pork were about ready for the market, amounting to from half a million dollars to a million dollars worth of this fat stock per county. Money was loaned on this stock. Banks had loaned this money on short time, and they had their obligations to meet, and the commercial phase of it was certainly severe. One of the banks in Davenport, Iowa, one of the richest banks in the country, early in the outbreak, had borrowed $800,000 to tide them through, and to help their country customers or banks in the country towns. And I will tell you, gentlemen, when you pinch the banking business you are up against a real problem. I learned one thing in this quarantine, and that is this, that every man or set of men engaged in their line of business, are running the line of business for all there is in it, and they propose to run it over or through every obstacle that is in the way. So the maintenance quarantine is not an easy problem under these circumstances. Yet I must express my thanks to the good people of Iowa, that they suffered as patiently as they did in a commercial way. And there have been indirect losses. In fact their secondary bills are piling up now before the committees of our legislature; instances of where hogs died of cholera, some of them when the serum plants were closed all over the country, and claims are coming in, about $25,000 per county, and the claims’ committees, I think, feel that they have a big problem on their hands to know how far they can follow these losses and these claims, secondary claims as they are.

We haven’t had any trouble. All the people having
infected animals have submitted readily to the destruction of
their animals on faith; faith in Congress that the Federal
appropriation would be made, faith in the Governor of Iowa
and the Legislature of Iowa that they would appropriate suf-
cient money to pay their half of this loss.

There is some quibble down at Des Moines about these
appropriations. One thing that seems to worry the legislators
more than anything else is the fear that there has been some
grafting by some veterinarians in the field. However, as we
chase up these stories of graft we do not find much foundation
for the report.

We are going to go on with the work thoroughly. We
are going to stamp it out in Iowa. I want to say to the rep-
resentatives of other states here who have been kind enough
to do some business with us in our free territory, to receive
some of our shipments, that I stand your protector to the best
of my ability. I will not allow any shipments, emigrant or
otherwise, to leave the State of Iowa, that I have any reason
to believe might carry infection with them. We feel indebted
to a number of states for the confidence they have reposed in
us in this particular, and I want to assure you that we will
protect you to the very best of our ability.

Illinois.

Dr. O. E. Dyson: Mr. President and Gentlemen: After
listening to Dr. Mohler's paper I don't believe there is a doubt
in the mind of anyone here as to what disposition should be
made of an infected herd. From our record on the bulletin
here I believe that some little explanation should be made as
to how we happen to be at the head of the list. We are not
there by choice, I assure you.

The fact of the matter is that we woke up in Illinois about
the first of November to find that we had an infection of foot-
and-mouth disease, and a few days later we found that we had
the disease spread in fifty counties within the state. In addi-
tion to that we found that we had at least 450 car-loads of
cattle that had been shipped from the Chicago yards from
October 15th to November 1st. Many of these car-loads had
been split into six or eight different lots, scattered on that
many different farms, thus exposing an innumerable number
of herds. Furthermore, we were absolutely unprovided with
means to contend with such an outbreak. We had no organ-
ization. We had a force of 125 assistant state veterinarians,
but they were scattered in various parts of the state. While
we had quite a number of veterinarians, they were all "gen-
erals,” and we had no “privates.” For the successful handling of outbreaks such as this, it has been conclusively demonstrated that it must be done by the small unit, that is, that you must have a man at the head of each unit, that is, several counties, a responsible man that the other men shall all work under, and be subject to his direction. I found that it is absolutely impossible to keep in personal touch with 125 veterinarians supposed to be working under your direction. Half the time you don’t know what they are doing. They double on each other’s tracks, and they have differences of opinions that it is not possible for any one to adjust at long distance.

So the matter comes down to what shall be done in the future, what methods shall be adopted, ways and means of handling the disease. I think the principal factor is competent men and means. You must have competent men, and you must have means. I think we would have had enough competent men to handle the outbreak in Illinois in a very short time, if we had had the means. But when you go out to a man’s farm and tell him that he has got to slaughter $10,000 worth of cattle and hogs and put them in a hole in the ground, and you haven’t anything to offer him except a promise, and he concludes that he will go and consult his attorney, and that gentleman tells him that before he slaughters his animals he wants to see his cash in hand, or a promisory note that will be good at the bank, you can imagine what you are up against.

The Federal Government was not much better fixed financially than the State of Illinois. I believe they had about $1,000,000 to start with, but that was soon exhausted. So in addition to our “short change,” the Federal Government could not offer the man anything but a slip of paper saying that in case Congress appropriates funds we will reimburse you for the losses sustained. That, I think, is the principal cause of delay.

We met with opposition in Illinois on every hand. We were very unfortunate in the first place to be tied up with the dairy herd that was on exhibition. The disease first broke out in the dairy herd. It was a “white elephant” on our hands. We did not know what to do. The only thing we could do, rather than to face an injunction, was to place them in quarantine. Then as the result of placing the dairy show cattle in quarantine, that question was brought up by every man, I think, that owned an infected herd. He wanted to know why his cattle were not treated the same as the dairy herd in Chicago. We tried to explain it, but I don’t think that we ever succeeded in a single instance in making a satisfactory expla-
nation. Really, on the face of the proposition, I don't believe that we will ever be able to succeed in making a satisfactory explanation.

I believe that the problem of right dealing with the foot-and-mouth disease is essentially a national problem. I believe that it belongs exclusively to the Bureau of Animal Industry. I believe that the Federal Government should assume all obligations in the matter and foot the bill. For this reason a contagious disease such as the foot-and-mouth disease can not be a local problem. The success of the live stock producers of the entire nation depends on the eradication of the disease. As long as we have a single case of infection in the State of Illinois the live stock interests of the entire United States are menaced, and I believe that the Bureau of Animal Industry is the only force that can possibly contend with it. They have a lot of experience. I don't believe that there would be any trouble in eradicating another outbreak, because they have a lot of experienced men at the present time. That experience has been purchased, there is no question about that. I believe that it is just the same with them as with anybody else. You have to buy your experience. They have got a whole lot of experience in the present foot-and-mouth disease outbreak.

I think that some action should be taken by this Association in the form of a resolution or something of that sort, that would tend to settle on some definite policy in regard to handling this disease in the future. I don't believe by any manner of means that we are out of the woods at the present time. We will have to contend with it next summer, and I think it would be well to handle that matter at this time. (Applause.)

Kentucky.

Dr. Musselman: Mr. President and Gentlemen: You can see by the chart that Kentucky has 119 counties accredited to it, but we have 120 counties, as a matter of fact, in nine of which we find foot-and-mouth disease listed. We attribute the entrance of the foot-and-mouth disease into Kentucky in every instance to shipments from the Union Stock Yards in Chicago of feeders and stockers. Our losses were forty-six herds at the appraised value of about $42,000. We met with considerable opposition in our work, particularly because some of the cattle belonging to this dairy herd in Chicago came from Kentucky. They were not killed, they were put in quarantine, as you know, and as they were owned by rather prominent people in Kentucky it was generally known that
those cattle had not been killed, and that caused us considerable trouble.

I believe with Dr. Dyson, that the Federal Government should take some hand here and relieve the whole situation. I think that that would be the very best way to do it. As far as our co-operation with the Federal authorities is concerned, I think it has been perfect at all times. We could not have worked alone, and we are very much indebted to them for their assistance.

We thought that we were entirely out of the bushes until a few days ago when we received notice that hogs shipped through the stock yards at Louisville were found infected in Pittsburgh, Philadelphia, and Baltimore, and a number of other places, but we have not as yet been able to find any infected hogs in Kentucky near where these shipments originated. In the Bergham Stock Yards on the 8th of February we found a few hogs with foot-and-mouth disease. In quite a few of the slaughter houses in the city of Louisville we found some hogs that had gone through that had foot-and-mouth disease, within the thirty-six hours previous to that time. We had one bunch of twenty-eight cows that were in Jefferson county, within the city of Louisville, that were owned by a man who ran a dairy and a butcher shop. He would milk his cows for a while, and then he would kill them. In most of those cows we found typical foot-and-mouth disease. Of course they were ordered slaughtered, and that was to have been completed yesterday. They were not appraised, at least I have not been notified to that effect.

Comparing conditions in Kentucky with those existing in other states, we feel that we have gone along very nicely, and we are very grateful that we have gotten off as well as we have. I would like to here and now offer my sympathy to all those who have had anything to do with foot-and-mouth disease, and particularly with the eradication of foot-and-mouth disease, and I ask for theirs.

Maryland.

No representative present.

Massachusetts.

No representative present.

Michigan.

Dr. Dunphy: In regard to this outbreak of foot-and-mouth disease in Michigan, Dr. Mohler has gone into the his-
tory of the case, so that it is not necessary to go any further with that. Only I will say this, that Michigan—one county in particular—got saturated with the disease, as it were, for the simple reason that it was in a very, very benign form, so much so that some of the farmers did not pay any attention to it, and some that called in a local veterinarian had their animals treated, and they would tell you that they were all right, that they were all well. The milk from these animals was going to the creameries at the time and the skim milk from the creameries was going back through Michigan and to the northern counties of Indiana, and being distributed to the farmers and fed to their hogs. That gave the disease a chance to become very wide-spread. As soon as it was thoroughly established that it was foot-and-mouth disease in the State of Michigan, the Bureau of Animal Industry immediately quarantined that county and the adjoining counties. To show you how thoroughly that quarantine was made and respected, the County of Cass is within three miles of the infected district, and you will notice by the map that the County of Cass never became infected, although, as I say, only three miles divide it from the infected area in Berrien County.

Now we were in hopes at one time that the whole outbreak in Michigan would be confined to the County of Berrien. But, unfortunately it reached the stock yards just at a time when Michigan farmers were providing themselves with stockers, and we had stockers from the stock yards distributed into some twenty counties in Michigan, and fourteen of these counties became infected directly from the stock yards. Outside of the farms that received the feeders from the stock yards there was only occasionally another farm that got infected. In many cases in the county only those herds that came direct from the stock yards became infected. They were discovered, and they were put under the ground, and everything was cleaned up before it got a chance to spread to the adjoining farms.

We had altogether in Michigan, fifteen counties infected. We lost altogether, 2,942 head of cattle, 829 sheep and 4,019 hogs. Now understand that all these animals were not infected with the disease. There were very few sheep infected, but the animals were all killed, a great many sheep and a great many of the hogs, and a great number of cattle, being considered exposed animals from the fact that the disease was on the farm. All the ruminants and hogs were killed on each farm where the disease existed. The State of Michigan’s share in the cost of these animals, that is, the cost of disinfection and
cleaning up and the property destroyed, was $110,513.76. That was about 1.35 of one per cent of the value of the live stock in the state. A very cheap insurance, we think.

Now we have had no other outbreaks in the State of Michigan since the 7th of January. We have false alarms every few days, and we inspect the premises immediately, but we have been fortunate enough not to find any outbreak since the 7th of January. Our co-operation with the Bureau of Animal Industry and our association with them has been very splendid in every instance.

We had no inspectors in the state at the time that this outbreak was discovered, excepting myself, and I was a helpless cripple going around on a hickory crutch, and the Bureau of Animal Industry immediately brought on their inspectors, and we co-operated with them in every way we could. I must say that our State Live Stock Sanitary Commission deserves a great deal of credit, and especially the president of that Commission, for the reason that he became active at once. He went to the Governor immediately, and to the Auditor General, and told them what we were up against, and they very agreeably said to him, “Go on, stamp it out, and we will stand back of you.” A great deal of credit is due to our Governor and Auditor General. I must say that we have had a very friendly co-operation from the people of Michigan. There were occasionally people who objected. Once in a while a man objected to taking Uncle Sam’s promise for his pay, but when we reasoned with him a few minutes and explained to him that his farm would be quarantined, and that he would run the risk of spreading the disease all over the neighborhood, or that he would have to stay on his own farm, why he was satisfied then to take Uncle Sam’s note for his money.

Montana.

Dr. Butler: In case the resolution in regard to offering sympathy should fail, or if the gentleman from Kentucky should be overlooked, I wish to offer him my sincere sympathy at this time.

By looking at the map you would think a great deal of our country was infected. Montana is a very large state, and while there is a great deal of red up there on the map, I think we are out of the red now; I think we are absolutely out of the woods, and in the clear. The first information that we got of foot-and-mouth disease in Montana was on the 4th of November, when we were notified that there was a shipment coming to Montana, which was then at Glendive, and was sus-
pected of having foot-and-mouth disease. There were twenty-seven cars in that particular shipment, containing something like 950 head of cattle, consigned to five points in the state. These cattle were immediately confined to the yards in Glendive, and three Montana state veterinarians were sent there, and they diagnosed it foot-and-mouth disease. Later Dr. Treacy of Bismarck, North Dakota, inspector in charge, came down and confirmed the diagnosis.

Three cars of that shipment were consigned from Chicago, and they left Chicago on the 31st of October. They were consigned to St. Paul, but they were transferred at Minnesota Transfer, and were tied on to this train load of 27 car-loads of cattle. They were fed at Sunnyside, North Dakota, and the entire shipment was exposed at Sunnyside, and when they got into Montana, showed the symptoms of foot-and-mouth disease. That was the first information we had. The moment we got that information we immediately got out orders that all shipments of cattle that had come into the State of Montana since October 15th, should be inspected. In looking over these records we found that there had been a shipment of three car-loads unloaded at Terry, which had been shipped out of Chicago on the 31st of October. One of our veterinarians went out there, and looking over the cattle failed to find any symptoms of foot-and-mouth disease. These cattle were out forty miles on what was known as the old X. Y. Z. ranch. They were placed in quarantine. Three days after that the Federal inspector, Dr. McCabe, went out there, and the animals at that time showed the lesions of foot-and-mouth disease. The period of incubation for that particular shipment was over fourteen days. On the next day our men went out there, together with Dr. Treacy, and all the animals were showing positive symptoms of foot-and-mouth disease at that time. The owner of the cattle, Mr. Adams, said that they had shown the first symptoms the day before. That, of course, somewhat frightened us in that its period of incubation had been over fourteen days, and we immediately sent inspectors all over Montana to look up every shipment that had come into the state. It was very fortunate that no other areas of infection were found in any other part of the state.

Now, when these cattle at Terry had been unloaded, the milk cows around town went over toward the yard, and they were infected. From Glendive, in some manner or other, either by means of dogs carrying the disease, or birds, the infection was carried out to what is called Velvet Prairie. The disease was found in some cattle that had been unloaded
at Glendive. We immediately put our range riders at work. I might say to you that when the cattle were unloaded at Glendive, inspectors and deputy sheriffs were placed there night and day, and no one was allowed near the yard. When infection was found we immediately put range riders on the job, and the people were compelled to clean up their ranches; no one was allowed to leave the ranch and no one was allowed to go on the ranches where we found the infection. The last animal was destroyed and buried on the 22nd of December.

Seventy miles south of the town of Terry, on the 6th of December, we had another outbreak at a place called the Hope Ranch. We don't know how that infection got there, but we have reason to suspect that a brother-in-law of this particular ranch owner brought it there. The brother-in-law had been at the town of Terry, and he went down to the ranch to visit Mr. Hope one day, and Mr. Hope claims that through malice he brought some of the infection of foot-and-mouth disease. We know this, that he hung around the corral, around the milk cow, and in five days after this brother-in-law had appeared on the ranch, the milk cow and her calf came down with foot-and-mouth disease. Mr. Hope had bought some cattle not very long before, and he was locating them and bringing them into his corral every night. In about five or six days they all came down, so that on about the 16th of December, 72 cattle out of 79 had the infection. We traced that infection to Belle Fourche, but we found no other cases in South Dakota or any place else, and we have every reason to believe that this infection came from this man.

At different times we disinfected every yard and every stock car in Montana on every railroad. We had men from Idaho and from Canada, and we worked down to the Idaho and the Wyoming lines, so that every stock car and every yard in the State of Montana was disinfected. We had at times twenty-six veterinarians at work there. We killed 1,408 cattle, 218 bucks, 17 lambs, 3 sheep, and 11 hogs. None of the sheep were infected, as far as we could see, but as we were going into our breeding season, and the bucks were only used to start to breed, on the 5th of December we placed these bucks in quarantine. It would put a man to an enormous loss if we were to kill the sheep. We found no infection in any of our sheep. It cost the State of Montana $44,895.80 to clean up foot-and-mouth disease. It cost the Government, from the figures that we have, $43,334.20, making a total of $88,230.

Now we believe that we have foot-and-mouth disease absolutely eradicated in Montana. The last case that was
reported—a new case—was on the 6th of December, and the last infected animal was destroyed and buried on the 22d of December. Every place where the disease showed up has been disinfected and cleaned, and we have taken great precautions in disinfecting stock cars and so forth. While we have had men continually inspecting all around that country, at the different ranches and on the ranges, and our range riders are still riding through that country, and we have still a few deputy sheriffs working, we have had no further cases reported.

I might say that I think one good thing that comes out of this trouble is that the legislature passed a bill, that is, that the House and Senate agreed that there would be no objection to it at all, to give to the Sanitary Board an income taxation of two mills on all live stock which was raised, an income of something like eighty thousand or a hundred thousand dollars a year for live stock sanitary work, in addition to our appropriation to run our office. The Sanitary Board has an appropriation of $15,000 a year for office expenses, and we also have an appropriation of $15,000 a year for tuberculin testing. The state veterinarian's salary, the salary of one of the clerks, and the salary and expenses of the assistant chief veterinarian also come out of the direct appropriation from the general fund. They also have provided that we shall have a reserve fund of $50,000 in the treasury always to our credit, to be used in case of emergency. When the Sanitary Board or the state veterinarian declares that an emergency exists, then we may draw on this fund and use it as we please, for the indemnity of cattle, for the employment of scientists or veterinarians. (Applause.)

**New Jersey.**

No representative present.

**New Hampshire.**

No representative present.

**New York.**

Dr. Devine: Mr. Chairman, I don't see anyone else here present, so I will grasp the glory. I have not looked up the figures, so I am not in position to give a complete report of the situation, but our experiences are very similar to those which the rest have recited; they do not differ very much from those of other states, except that we have had foot-and-mouth disease so often that our people are getting used to it, and they
do not object to being quarantined, and do not give us any trouble along that line.

An unusual thing did happen with us this year in this outbreak. At Long Island City we have so many of these city dairies that you might say they are almost as numerous as the big buildings that you have down town here. They are on each corner. The question of quarantining the assistants presented a very difficult problem, and it doesn't look as though we accomplished much in quarantining the attendants, or the premises or anything else, because it spread from dairy to dairy. One thing of interest that occurred to us down there was that this outbreak seemed to upset what the books give us as to the period of incubation. In other words, the conditions seemed such that it was hard to believe that we had infection after we quarantined these farms, or dairies. I recall distinctly in one locality where there were four or five dairies with from 50 to 300 cows on each place, and there was a veterinarian in that locality that took it upon himself to examine those cattle, and while some of them showed peculiar lesions, he advised all these people, who were of Jewish extraction, that they should not allow the state or Federal authorities to interfere with those animals, that is, that they were not affected with foot-and-mouth disease. Dr. Wills, who had this work in charge, and some of the Federal men, asked me if I would go out and look at these cattle with them, and I did so, and I told them that while I agreed with them, that they were not characteristic lesions, still I thought they were foot-and-mouth disease lesions. In the face of objections from the veterinarian that was brought in, and from some experts, we quarantined the herd with the hope that they would either develop it more definitely or that something definite would happen. In one dairy there was a calf that we inoculated that day, and after a week or ten days had elapsed, the calf not showing lesions up to that time, of course the veterinarian began to chide us. But the calf did develop foot-and-mouth lesions shortly afterward, and within three weeks after the herd was quarantined seventy per cent was broken down with acute lesions. They had only shown small cicatrices before, and we took special precautions, but in just three weeks' time, as I said, seventy per cent of that herd was broken down with acute lesions. Now was that a reinfection? Had they been infected and were they recovering when we saw them first? Or was the period of incubation three weeks? That is the only thing of especial interest that has happened to us. The
figures on the chart speak for themselves as well as I could give them to you.

Ohio.

No representative present.

Pennsylvania.

Dr. Marshall: Mr. President and Gentlemen: The first intimation that we had in Pennsylvania of foot-and-mouth disease in the United States was on the 19th of October. We learned that foot-and-mouth disease existed in Michigan and the northern part of Indiana. Fortunately we were pretty well prepared for an outbreak of foot-and-mouth disease. That afternoon, the 19th of October, we ran out a great number of letters over the multigraph, and sent them out to over 800 veterinarians in the state and to the commission men and the cattle dealers and to the agricultural papers, warning them of the outbreak, and to be on their guard for any evidence of the trouble. Things with us were quite peaceful for the next ten days. We expected to have calls from all directions because of suspicious cases at least, but we were not disturbed. We had time to look over our records, the regulations governing quarantine, and the methods that were used in the previous outbreaks. We got everything in good shape, and were practically sitting on the fence looking for trouble. Ten days later trouble was reported; that is, on the 29th of October. Then we found the disease. We found it in two different places in the state, one in Wilkinsburg, and one in Lancaster County; we got busy at once, and the campaign was on. After that, trouble came thick and fast. You can see the story as it is told on the chart pretty well. Dr. Dyson beat us in the number of animals destroyed, but we beat him a little in the number of herds infected. I don't know which is entitled to the greater glory.

We were pretty lucky in Pennsylvania on being so well organized. We had an outbreak in that state six years before, and we had one hundred herds infected at that time. It was cleaned out in three months, and no recurrence of the disease followed it. The state was free from disease for six years and over. Another thing that was to our advantage during that outbreak was that the United States Government and the State of Pennsylvania made all of their promises good. They paid every bill. We had a few complaints at first that our state had not paid up all the claims against it from the previous outbreak. They said the Government had not paid
their part of the cost, and we offered them a prize for any case where it was shown that the Government defaulted in payment, or where the state defaulted in the payment of its share, and yet we have not been shown a case where every bill was not promptly and completely settled from the previous outbreak. So our people had a little more confidence in the ability of the state and the Government to pay bills, and they were better trained to know what quarantine meant. We had a good lot of trained men in the state. We had enough men there that had seen the disease before so we were able to start to work right away and carry it through.

The infected territory was divided up into six different districts, and we had an experienced man, together with a Federal inspector who had also had experience with this disease, in charge of the Pittsburgh yard and the Lancaster and the Reading and the Philadelphia yards. They were all men who had had experience in the former outbreak, and they rented offices, and agents were sent in by the state and Federal Government to help them. The work was carried on in practically all those places by men who knew the disease, and who knew the peculiar characteristics of the people in the particular community in which they worked. The worst trouble we encountered was when the outbreak first occurred. In the Lancaster Stock Yards on the 3rd of November we had 1550 head of feeding cattle that were not ready for slaughter by any means. Eighty per cent of them had been sold to farmers for feeders and stockers, and we looked the cattle over that were in the yards at that time, and could not find a symptom of disease among them, but we did find two herds in that same lot of cattle which had the disease when they reached the farms, and the Government and the state authorities thought the proper thing to do was to quarantine the other animals in the yards. The people who owned them did not agree with us at first, but it was finally decided to quarantine those 1500 head of cattle. Eighty per cent of them had been sold, and would have been delivered around among the farmers if the Government had not gotten busy and held them. Mr. McLean, the president of the stock yards, told me of 2500 head of similar cattle that had been distributed around the state during the period that the infection existed, so you see we had a very discouraging outlook to begin with. The railroad companies and the commission men furnished us their shipping lists. We soon had more places to look up than we had men to do the work. In a good many places the herds
were quarantined before any symptoms of disease appeared. We knew that they were infected cattle.

In the Lancaster Stock Yards, where the 1500 head of cattle were quarantined, in three days we had 72 head of infected animals. And that ran on then to about 700 herds.

Another thing that was in our favor in the handling of the outbreak, besides the experience that we had and the good reputation that the state and the Government had made for themselves in paying the bills, was the fact that we had a little money on hand at the time, not enough, by any means to carry us through, but we had something over $60,000 to begin with, and we had a pretty good trained body of assistants. But the money did not last long. We soon got through with that $60,000. It was not enough to dig the graves, or it was not enough to pay the men working on the appraisals. Up to the present time the cost of doing the work and the appraisals have amounted up to something over $800,000. We have an application before the Legislature now for $500,000. That has passed the House without a dissenting vote. It has passed the agricultural committee of the Senate, and I have pretty good assurances that it will pass the Senate to-night and be ready for the Governor's signature tomorrow morning. If we can begin to pay bills pretty soon I think we will be in pretty good shape.

Now we felt pretty safe until last week. In the last two weeks we have gotten bumped again. There were 37 different shipments that came in during the last two weeks infected. Some of them were from Chicago, some were from Louisville, some from Buffalo, and some from Indianapolis, from free territory in Ohio, and from the Baltimore Yards—it seemed that every place the animals came from they came with infection. Now, whether they started with infection from the points of origin or not, I don't know, but they got to Pennsylvania with the disease. They might have been infected in transit or in the yards, and some of them were infected after they got into our state, evidently, but it has been a little discouraging to have so many new outbreaks of the disease. Fortunately we have not been accepting cattle for any purpose except slaughter. These animals are all caught in the stock yards or in the slaughter houses. There are about half a dozen farms that have been infected from the small slaughter houses. The animals that were sent to the stock yards were permitted to go out for immediate slaughter, and by immediate slaughter we meant 72 hours. Sometimes the butcher did not mean that. He did when he got the permit,
but he didn’t mean it after he got them home. Instead of killing them immediately, he took them out to the farm and kept them for a week or two weeks, and the next thing we knew we had another outbreak of foot-and-mouth disease; and we have had about six outbreaks of that kind in the last two weeks, and the business of giving permits in that way has been done away with.

We have established about six different quarantine orders in the state, and the Government and the state have been working hand in hand. We have been getting along immensely well, and I don’t know of any criticism I can make against the Government, and I don’t know of any criticism that they have to make against us. I don’t know that I should quite agree with Dr. Dyson that the Government should do it all, should take care of the matter altogether, take it over entirely. It seems to me that it is up to the state to do all that it can. There is, in fact, enough work for the local authorities and the state authorities and the Government to do. It seems to me in the small outbreaks the states should do the greater part of the work, and in the big outbreaks probably the government should run things. (Applause.)

Rhode Island.
No representative present.

Virginia.
No representative present.

Wisconsin.

Dr. Eliason: Mr. President and Gentlemen: There are some things that I just wanted to dwell briefly on, and one of the matters I wish to speak of is the matter of obscure infections. We have had in a number of different places infections that came from shipments of cattle from infected districts. Out of those we have had something like forty cases that we can say developed the disease at the time; the rest of them are secondary infections. Now, we have a few herds in Wisconsin which have seemingly not been infected from this source. One herd is situated as much as 150 miles away from any source of infection. The disease dropped there out of the clear sky. The only suspicion that we have, and the only explanation we can make of it, is that the man who owned the herd was down here at the time of the dairy show. He returned to his farm from Chicago on Thanksgiving day and
went out to his herd; as it was a very nice day, he probably had the same suit on that he had while he was down here in Chicago, and probably looked over some of his pet calves. Anyway, they were infected. Later we had an outbreak which seemingly came from people who had come from another state.

Now I can't help but think that we are not out of the woods yet. We are going to wake up some morning and find that we have a center of infection where we least expect it. We have got to expect that.

I have nothing to offer on the plan we have been following. The state and the Government have co-operated in the best manner they could, and I think that we did very good work, considering the fact that we had no men in the state that had had any experience with the disease, with one or two exceptions. However, many of the local men took their coats off and went to work, and in a good many cases it meant a loss to them in their own practice.

We did not have any appropriation to start with; we just simply had to go out and kill the cattle on the promise that we would be good fellows and go up and see that the legislature did its part. Fortunately, the present legislature has just about passed a bill which will not only pay for those cattle which are slaughtered, but also provide for such emergencies in the future. The appropriation is not limited to tuberculosis work, or anything in particular, but it is for the eradication of any disease of this kind. The public treasury is open to us; there is no back door to it, either. So in the future we will have ample money and I think we will also have sufficient appropriations so we will be able to put men in the field.

Our campaign opened after election day. I was notified on the night of election day that an owner had reported to a local veterinarian that he thought he had it, and he surely did. After that things developed fast.

I have a lot of praise for the Government men that came in and co-operated with us, and I think we were particularly fortunate in having Dr. Behnke with us.

Dr. Luckey: Mr. President, I want to inquire of those who have had experience with foot-and-mouth disease, if it was noticed that silage or any other feed had a tendency to attenuate the symptoms? It seems to me that some of those who have had part in the slaughter of numerous herds ought to have at least seen foot-and-mouth disease in herds that were
on silage, and I have a particular object in inquiring whether or not the symptoms were more marked.

Dr. Marshall: I have not noticed any difference.

Dr. Melvin: I don't think there is any difference in the feed. We have had a shipment here recently which had been fed partly on silage and partly on alfalfa hay. I don't think there is a particle of difference. There is, though, an apparent increase of virulence in disease that passes from one section to another.

Dr. Luckey: The reason I ask that question is that we had one lot of cattle which had been in the Yards in Chicago on October 25th and 26th, if I remember correctly, and we fully expected to find that shipment diseased, but on examination on November 9th no symptoms had appeared. We were not satisfied, but continued to re-examine those cattle every day, and about the 12th some were showing mild symptoms, nothing like the characteristic symptoms that we saw among cattle here in the Yards. The period of incubation we thought was passed. On the 8th of December I saw two animals in that lot which apparently showed fairly well-marked symptoms of foot-and-mouth disease. On that day I got my hands badly soiled with the saliva of those two which were showing symptoms, and I took three suckling calves and simply rubbed this infection into their mouths, which I thought would amount, from a practical standpoint, to a test. But this herd was fed on silage, great chunks of which were molded and caked, though a part of the silage was good. The question arose in my mind whether a moldy silage was producing a stomatitis, or whether an added condition or something connected with the silage might have attenuated the symptoms of the contagious foot-and-mouth disease. The three calves which we inoculated we placed upon a feed of bran and alfalfa hay, but we were unable to produce any symptoms in them. Still we were not satisfied, and we took some saliva from the affected animals and got two calves and inoculated them and gave them quite a time to develop, without any symptoms appearing. Yet I saw in this herd two animals that had symptoms that I would have been unable to distinguish from those of foot-and-mouth disease, with the exception that they were very mild compared with what I saw in Chicago. It occurred to me that probably the acid of the saliva may have attenuated the symptoms, and I wanted to be sure that I had not made a mistake.

Dr. Gibson: Mr. President, I would like to have Dr. Pax-
ton, who is working in Iowa, representing the Federal Bureau, describe the case of one heifer in which the period of incubation seemed to be very much drawn out. Dr. Paxton can give the particulars, as he examined this animal and finally made the diagnosis.

Dr. Paxton: The case that Dr. Gibson refers to, gentlemen, was shipped out of Chicago on the 21st of October. Our first inspection of that herd was on the 6th of November. At that time we noticed that there was a little yellow discoloration on the tongue. The next inspection, made by the assistant state veterinarian, was in three days. One of the Bureau men saw it again in another four days, and nothing further had developed. There were several inspections made of this animal, and the only pronounced symptom was a little further coloring of the tongue. On the 21st of November I went to see the animal again. The shipment had been split into two herds. There was nothing further to be found in this heifer at first glance, but after we had "rassled" her and I had tried to break what appeared to be a vesicle on the tongue, my arm coming out, I let go of the heifer's nostril and found that I had broken a vesicle. That was a typical vesicle, and upon further working of the tongue, upon pulling it out as far as we could get it, we found vesicles broken on the side of the tongue, and afterwards we were able to break a number of vesicles on the dorsal surface of the tongue, typical foot-and-mouth lesions. This animal was in a herd of 32 animals, and up to that time we could find no lesions appearing in any of them. This herd was killed on the 27th of November, and the report of the inspector in charge of slaughter was that at least 40 per cent of these animals showed acute symptoms of foot-and-mouth disease.

Mr. McFadden: Mr. President and Gentlemen: I have been listening to the various discussions of foot-and-mouth disease, and I wish to make a few remarks regarding the cleaning and disinfecting from what I have seen and observed in this outbreak in 1914, and the one in 1908. I have been through two campaigns with the Bureau's doctors. The recent one has been very severe. In the first campaign we cleaned up and disinfected the entire premises, which took us fourteen days, and both the state and Government doctors, when it comes to cleaning and disinfecting the premises, I can say are mighty severe. From the first part of November until today I believe our premises have been cleaned on five different occasions. The Pittsburgh Union Stock Yards have spent during that period forty-six thousand and some odd dollars.
The yards were closed a week ago last Tuesday. A week ago last Monday we had 2,200 cattle, 12,000 hogs, 6,000 sheep and about 5,000 calves. Dr. Melvin placed an embargo on all interstate shipments out of Pennsylvania, and I went down and requested that the yards be released for a period of a day and a half so as to get the live stock to their points of destination in Dr. Marshall's territory. Dr. Melvin was very much pleased to comply with my request.

On Tuesday we started to clean, and the yards were thoroughly cleaned and disinfected. In the meantime I had placed an embargo on all live stock into the Pittsburgh Union Stock Yards for all purposes. Nothing has been unloaded. Everything has been fed and watered in transit. Previous to this recent outbreak we cleaned and disinfected those premises four times under department and state supervision.

Two days after we were open a bull was brought in from Ohio. It was pronounced free, and was kept in the yards for seventy-two hours, and during that period he contracted the disease. Unfortunately Pittsburgh is situated so that we have to receive live stock from St. Louis, Louisville, Chicago, Indianapolis, and Cincinnati, and of course naturally in the vast traffic that exists over the Pennsylvania and the Baltimore & Ohio railroads we are bound to get a little infection occasionally. I am always frightened after a shipment leaves the yards that Dr. Totten of the Bureau, or Dr. Marshall of the state, will notify me to clean and disinfect once more. So I wish they would get together and devise some means whereby there would be a protection for the various stock yards, whereby we can keep free, or be permitted to do business in some way, to eradicate the infection coming in, or avoid it coming to the various stock yards.

I must say that the recent outbreak a week ago has been the worst I ever saw. One load of hogs from Louisville, Ky., consigned to Philadelphia got as far as our unloading chutes. They were so bad that several of the hoofs broke off in the chutes. They were not permitted to go into the yards. The Government inspectors noticed them coming out of the cars, the majority of them being lame. They held them there for two days, with the co-operation of Dr. Marshall's force, and put them all into fertilizer, and since that time I venture to say that there have been 700 hogs destroyed after they reached destination. (Applause.)

Dr. L. C. Kigin: Mr. President, I believe that if this disease had crept in on the State of Nebraska some three months ago we would have had a great deal of serious trouble
there. Now, fortunately we have escaped the disease. But in that state, as well as in the states of Colorado and Wyoming we have a very severe form of mycotic stomatitis. After the first action taken by the Nebraska Live Stock Sanitary Board there were many letters received by the department, condemning the state authorities, and even condemning the Federal authorities for taking such drastic action in the central states. They claimed that they had had foot-and-mouth disease on their farms for the last fifteen years; oftentimes some three or four cattle, or even a dozen, or even fifty, had been affected with foot-and-mouth disease, and it never spread. I want to say that it took a great deal of educational work throughout that state to get those people down to the point where they would co-operate. It was only after resorting to the press, and publishing articles and describing the difference between foot-and-mouth disease and mycotic stomatitis, that we were able to get them to co-operate. There the average case of mycotic stomatitis was so severe that the feet of the cattle would become affected as well as their mouths. They cannot walk and their teeth will often drop out, and it becomes very, very severe, and for that reason we have had a great deal of trouble on different farms, especially through the northern and the central parts of the state. The people were very much up in arms about it, but after resorting to the press, the daily papers and all the farm papers, and making the situation clear to the farmers, we finally got them to feeling that they did not have any foot-and-mouth disease, and they are now more tractable.

The South Omaha Stock Yards is a place where many cattle come in from many different states. This is a place where the Board felt that they would have a great deal of difficulty in handling this proposition, as far as putting it under quarantine was concerned, provided it should become necessary. Now, on October 19th the Board was in session, and a telegram was received that afternoon from Dr. McElvin, recommending that all cattle that had come out of the Chicago Stock Yards after October 4th be put in quarantine. Immediately the Board acted and placed all the cattle in quarantine throughout the state, and by the co-operation of the Government men we went out and examined every herd that came into the State of Nebraska. These herds were quarantined for thirty days, and at the end of thirty days as many of them as we could get to, were re-examined. At the meeting that I spoke of, the Board deemed it necessary that all the stock yards and all the stock cars in the state, as well as
all the stock cars that come into the state, be thoroughly disinfected. We certainly owe a great deal to the railroad companies that are operating in Nebraska, to the fact that they immediately disinfected every car. I believe that they did as good a job of disinfecting there as if we had had a deputy to go with every crew. On Sunday they started from four to six crews out around the state and cleaned every car, and in two days they started out disinfecting, and they disinfected every car. They were quite sure that no car would come into the state unless it had been disinfected, or if there were any routed and not disinfected, they held them until they had time to properly disinfect them.

There is one thing I wish to bring up. We have had a great many people in the United States criticise the Bureau of Animal Industry for the manner in which they have handled this outbreak, but today we are reaching a point where we can begin to realize the efficiency of our great Bureau of Animal Industry in controlling this disease. I wish that a resolution be adopted by this Association and placed on record, approving the manner in which our Bureau of Animal Industry has handled this disease, and condemning the men who have recommended other methods of handling and eradicating this disease. I believe that we owe this acknowledgment, as an Association, to the Bureau. The Bureau of Animal Industry has not at any time held back, they have never failed us; they have had their men out at different places where there was only a suspicion that the disease might exist. I believe that this matter should be brought up at this time and that the Association should sanction the work that has been done and endorse and approve the methods adopted, and that the credit be given them that is due them for their efficient method in handling this matter. I also suggest that the motion be broad enough to include a condemnation of those who have criticised these methods.

Dr. W. J. Butler: Mr. President, some things have been running in my mind during this discussion. We have received a great many letters asking us what they are going to do with the dairy herd that has been held in quarantine down in Chicago, and when we are going to release our quarantine prohibiting the importation of live stock into the State of Montana. I would like to know, Dr. Dyson, what is going to be done with that dairy herd?

I would like to state right here for the State of Montana, and I think I may state positively that we will not receive a cow or a sheep or a hog from the State of Illinois or any other
state that accepts any of these dairy cattle until at least six or seven months after they have been released from quarantine.

Dr. Musselman: I am very glad that the gentleman from Montana brought that subject up. That question has been worrying me considerably. We have, in Kentucky, men who have quite a number of valuable animals in this dairy herd, at least they were very valuable when they came to Chicago, and they are still here, and I think a great deal of political influence has been brought to bear in trying to get permission to bring them back to Kentucky. I would like to know what is going to become of them. I would also like to go on record as stating that I object seriously to their returning to Kentucky for at least a year or so.

The President: I don't think that we need to worry very much about it. I think they will be held a sufficient length of time, and that when the Government permits them to go into interstate shipment they will have been held a sufficient length of time. Any further discussion?

Dr. Eves: I want to state that at the time of our outbreak in Delaware we had not a cent with which to fight the disease, and our Governor personally backed us and told us to go ahead. When the inspector, Dr. Schaufler, came before the Governor and told him what had to be done, he said that he hadn't any money with which to go ahead, and Schaufler said "if you haven't any money you cannot co-operate." And immediately the Governor told us to go ahead and he would back us, and he did.

Dr. Frank G. Atwood: I would like to inquire from Dr. Devine as to the case of these cattle that were slaughtered and used for food purposes, whether cooking would sterilize the meat sufficiently so that it would be all right for human food?

Dr. Devine: The cattle that were slaughtered for food purposes in that outbreak on Long Island consisted of about 30 or 40 per cent of those that were involved. There were about 4,000 head of cattle involved I believe—I am not sure about the exact figures—but I think perhaps that about thirty or forty per cent of those slaughtered, under inspection were passed for food, and the hides disinfected. I meant to speak of that at the time I mentioned this case before. I believe it is a little unusual in the handling of stock, but of course we took it up with the Federal authorities before we acted. We took it up with Dr. Melvin at Washington, and all the cattle that were exposed and showed no lesions whatever were used.
in that way. After we got into the work and saw that so many had to be condemned in that locality, they were slaughtered that way. We put them in large vans and conveyed them to a slaughter house. We had inspectors follow them, and took them directly to a slaughter house and slaughtered them there. Their hides were put into a dip, and then the vans were disinfected.

Dr. Atwood: Were these cattle selected from herds that were exposed?

Dr. Devine: Yes, they were exposed. There were some infected cows in the stables.

Dr. Atwood: Did these cattle that were slaughtered have any temperature, doctor?

Dr. Devine: No, they did not have any temperature. Those that were slaughtered in slaughter houses did not have any temperature. No animal that had any lesion of any kind was slaughtered in this way.

Dr. Gibson: Doctor, were any of them found infected on being slaughtered?

Dr. Devine: None whatever. No internal lesions whatever, so far as we could determine.

Dr. Gibson: Mr. President, the dairy show herd is a perplexing problem in Iowa, because we are represented in that herd, and I have incurred the displeasure of the Iowa representatives in that very herd by saying that I do not see how these cattle can ever return to Iowa. I find that good neighbors and friends of the owners declare they will start injunction proceedings the moment the cattle are moved toward Iowa. In speaking about the work of the Committee on Resolutions, I think possibly a carefully prepared resolution regarding this herd would be of some value. I just make this suggestion, because it is a rather perplexing situation for the officials in the various states that are represented in this herd.

Dr. Torrance: Mr. Chairman and Gentlemen: I have listened to this discussion on foot-and-mouth disease with a great deal of interest. In Canada we are getting like the man whose neighbor's house is on fire, and we are watching the fire department at work, and hoping no sparks will blow over our way. I wish to congratulate you upon the progress you have made in dealing with this very serious outbreak.

As regards the dairy herd in Chicago, I do not like to express myself at this particular juncture with any decision. I am waiting to see what people who are more largely interested in this matter than we are, are going to do about it.
There is only one Canadian herd in Chicago. They have not made any application to us yet for permission to return, and when they make that application we will have our answer ready for them. At the present time we are not stirring up any trouble.

The President: We have with us a representative from one of the large farm papers of the country, Mr. Bayard, Editor of the National Stockman and Farmer, I am sure we would all like to hear from Mr. Bayard.

Mr. Bayard: Mr. Chairman, I don't know what you want with me. I am a plain "hayseed" editor; you can see how my hair is thick with it. Eight years ago when we had this outbreak I took Dr. Pearson's word for it—I am a Pennsylvanian. This year I got on a rubber suit and went out to see it. I wanted to satisfy myself in regard to it. The first herd I got into satisfied me pretty well. I saw a much worse case than I have ever seen since, and I do not want to see any as bad as that again. It was a very malignant case. Some of the animals were dead, and quite a few of them in very bad condition. The cows would fall down, and did not seem to want to get up; they seemed very much depressed and out of condition. I noticed three that had a bloody diarrhoea. I would like to ask if that is characteristic of the disease?

Dr. Mohler: No. Only of the malignant form.

Mr. Bayard: This was, I think, a very malignant case, and I failed to see one animal in all this herd that did not have a bad odor. And the smell in that barn, gentlemen, was awful. I smoke Pittsburgh stogies and I smoked stogies all the rest of that day.

But there has been one matter here that has not been touched upon today, except by Mr. McFadden. I am familiar with the market, in fact for twenty-five years I have been on the Pittsburgh market every week when I have been in the city. Last year our markets were in bad condition. Our buyers were afraid to take the cattle away from the market. Our sellers could not find any outlet. Mr. McFadden told you the number of cattle and sheep and hogs we had there. I suppose there were 20,000 all told. Our sellers were up against this proposition: If they held their stock there and did not sell it it was pretty sure to get foot-and-mouth disease. If they guaranteed it to reach Philadelphia or some other point sound they didn't know but they would lose some on the way. If the buyers bought it, they were afraid that they would lose it. Well, it sifted down to this: The buyers paid 75 cents less
than the market for the stuff and took the risk, or the sellers, when they felt pretty confident that their cattle would arrive at the other end in good condition, guaranteed it, and some of them were left there for the Pittsburgh Packing Company to take care of, which they generously did at the market price.

Now, gentlemen, the thing that concerns us most in regard to this disease is the economic effect on our markets. I want to say our cash markets are gone. Today a man cannot ship a load of stock for market, and go home with money for it in his pocket. A man cannot get his money until the cattle pass inspection on the killing floor. We will be in the same fix until this is eradicated. We will have the same kind of a time that the Professor told a girl who asked him a question in our school, when I was a youngster. This was in a co-educational college, and the girl asked the Professor the old question: "What would happen if an irresistible force struck an immovable body?" And the Professor said he didn't know, but he thought there would be a hell of a time. And that is what we are coming to in our markets if this disease gets loose. I hope that all of you, that all our public influences will have the sand and the sense to stand up, as I have tried to do, and fight for total eradication, and not monkey with any other kind of control. I hope that is what will happen. (Applause.)

Dr. Melvin: I want to make two or three remarks, for perhaps five or ten minutes. In an outbreak of disease of this great magnitude there isn't very much time to organize and get ready for it. You have got to grab your hat and start, and that is what we had to do as soon as we knew definitely that foot-and-mouth disease was in the country. We investigate hundreds and hundreds of cases of reported disease of all domestic animals in various sections of the United States during the course of the year. When the country had been free from foot-and-mouth disease for six years, we had begun to breathe rather freely. The nearest we came to this disease was in England several years ago, and as that is several thousand miles away it did not disturb us very much, and then like a shot it comes up amongst us here. How it comes up we don't know.

In the first instance we sent to the field the men who had had previous experience with the disease. Previously there were practically no veterinarians in practice west of Detroit who had had any experience with the disease. There were a few, but not many. Now we put a green state force, an entirely green state force in the field, with these few exceptions. Our
first men were sent into Indiana and Michigan. Those were the men who had had previous experience. We had to get as many veterinarians as we could. We exhausted the eligible list of the Civil Service right away, and we had to make a great many appointments from among veterinarians who were willing to work for us in a temporary capacity. Altogether there have been over 2,000 veterinarians engaged in this work.

That leads up to the suggestion of Dr. Dyson and Dr. Marshall, with reference to the Bureau of Animal Industry assuming full control, the United States Government paying the bill. In the first place, it would be an impossible position to put the Bureau in to ask it to go into a state and regulate affairs within the state, unless it had laws which it could enforce itself, and not through second parties, such as the state authorities. It is impossible to get that authority without a change in the United States constitution and the constitution of every state, so that is a long ways off.

The whole thing more or less turns on this: We are trying to protect the majority of the stock owners, and in order to do that payment for infected and exposed animals that are slaughtered has to be made. It seems to me like a fair and equitable proposition for the Federal Government to pay half and the state to pay half.

This has been a good lesson—I won't say a "good" lesson, because there is nothing good about it that I can see, but it has been a very expensive lesson, and a very thorough one. If we succeed in getting rid of this disease, we will in the future have a force of men who are familiar with it, such as we have never had before, and the probability is that we can arrest the extension of it very quickly.

The question of disinfection of a person's clothing after having visited an infected herd is something of which the ordinary practitioner has never previously appreciated the importance. The importance of closely quarantining a farm so as to keep all the residents upon the premises, has never been fully realized, and it is not today fully realized, but it is much more so than it was. We are getting now into the question of the meat inspection problem, which has been touched upon here. It has been a comparatively unimportant question up to this time. I mean the inspection in the slaughter houses. Most of our work has been confined to eradicating it in the country, and in these city dairies. Now we are getting up to a proposition of all of the stock yards east of Chicago being infected, and having been infected and re-infected. And is this to continue? Can we disinfect those yards so they will
be absolutely safe? We have got to do it, or we will have that chaotic condition in the markets which has been referred to. It travels, you know, and the first thing we know we hear of it down in Philadelphia or in Pittsburgh or in some other place, animals show up in the slaughter houses with foot-and-mouth disease lesions, and we trace that back, and by the time we get it straightened out we have got the whole channel of the meat trade involved. It is like a river that flows on and on.

It is surprising how long it takes the stock to move from here to eastern points. This disease has developed in hogs within three or four days. Among these cases we speak of, we have found certain yards which had been crowded with live stock to full capacity, thousands and thousands of animals there, which it was impossible to dispose of at those particular places. We instructed the inspector that if he believed he could safely take some of these animals that were not infected and were not shown to have the disease, and move them to another market for immediate slaughter, he should do so. Many of the cattle have shown up at these markets with the disease fully developed, and within two or three days from the time of shipment—in fact almost over night.

The question of funds for combating outbreaks of this sort has also been dwelt upon, and most of the states are making appropriations for the future. It is unfortunate that the Federal Government and various states did not have this appropriation before. Several years ago I recommended to Congress a reserve fund for the use of the Bureau in outbreaks of this sort, but it was not seen fit to provide it at that time. Now in the agricultural bill they are making a provision for $2,500,000 to be available for use in such outbreaks. We were greatly handicapped at the start by not knowing just how much of our funds we could use. We had to stop practically all of our other work, except the meat inspection and work which had to be carried on under specific appropriation. All of our general expense fund, or nearly all of it, was turned over into this work. We took men off animal husbandry work and dairy work, and work of that sort, and sent them into the field, and everything was done that was possible in order to assist the states. The states were glad for our assistance, and we were glad for their assistance. I am firmly of the opinion that the only practical way is for the state and the Federal Government to work together in outbreaks of this sort, because then you have your two forces amalgamated and practically doubled, because the Federal Government in times of peace—and these are times of war just now—could not maintain such
a large force for several years as to be able to take care of an outbreak such as this. It would be an impossibility. But with what we can do and with what the states can do, we have then a very comprehensive force to handle it. I think that this is the logical way to do. I think every state should be fully equipped with its veterinarians and with a pathological laboratory, and have the whole thing thoroughly systematized, and it is their duty, primarily, to do it within the state, and it is the Government's duty, the duty of the Bureau when the trouble does develop, to go in and assist them in getting rid of the disease so that it will not spread to other states. I think it is an admirable condition, a condition better than would exist by leaving it all to one authority. (Applause.)

Dr. Ingrani: Mr. President and Gentlemen: This has been an extraordinary opportunity which has been afforded to us to gather here, one which is something out of the ordinary, and one which is of great value to us, as it gives us an opportunity to learn what we may do. It has been a very valuable lesson to us in our state. This trouble came into the little State of Connecticut from a neighboring state. We had no trained force, not a man in Connecticut had seen foot-and-mouth disease. Therefore it was necessary before we could carry out any work, to appeal to somebody that did know. I telephoned to Dr. Melvin. He said “Do you need some help?” I said “Yes, sir, we do.” He said “I will send some help to you,” and he sent a master hand, and he systematized the work, and we accomplished something. We have all learned from this experience how to carry on this work. It has been a very valuable lesson for us.

There is one thing I would like to do right at this time, Mr. President. I would like to make a motion that owing to the extraordinary value of Dr. Melvin and Dr. Mohler’s paper, that we have a large number of copies of that paper printed immediately for distribution. And Mr. Chairman, I would like personally to thank the Bureau of Animal Industry for the assistance given us in Delaware.

(The motion was duly seconded and carried.)

Dr. Frank G. Atwood: I would like to inquire from Dr. Melvin if it would endanger the eradication work if the animals that did not run a temperature and showed no advanced typical lesions, were slaughtered, and the meat was preserved, in the way Dr. Devine outlined. In several of the European countries they have regulations for the slaughter and canning of such meats.
Dr. Melvin: The condition on Long Island was very peculiar. We had a somewhat similar condition, I think, in the vicinity of Newark. We were in a city neighborhood, and you could not bury your animals, you had to haul them away, whether they were healthy or whether they were diseased. The diseased animals were killed and hauled away in "dead" wagons, and then transported by tugs to an incinerating establishment. As Dr. Devine has stated, the dairies were built on city lots, just the same as buildings would be in any city; there was no back yard, there was no farm feature connected with it, and the disease was in these herds and had evidently been there for some time in a benign form. Many of the animals had apparently been treated for a long time, and there were several hundred in absolutely normal condition, without lesions of foot-and-mouth disease, without temperature, or without any evidence of disease whatever. It was a question of killing them while they were in a healthy and normal condition, or keeping them there indefinitely, until they developed this disease, and had to be disposed of in the way that I described. It seemed to us that the only sensible way to dispose of them was for meat purposes, while they were in condition to be disposed of. They were not canned and marked as coming from diseased cows; they were normal animals, they were fresh meat, absolutely normal in every respect. If you hold any animal long enough he is liable to get some sort of disease. Why hold these until they became sick? Why not dispose of them? There were facilities there. We had done the same thing in some other places where we could do it. In one instance in Maryland a man got a lot of steers from Chicago which developed the disease. They were put into a field by themselves. On this same place he had some 40 or 50 hogs in another field. We did not wait for those hogs or dairy cows to get sick, but disposed of them for food, and killed the infected steers and buried them on the place. But that can not be done ordinarily, because the danger of exposure on roads leading to shipping points and of spreading disease in various pens is too great. You can not do it, except in a very small per cent of the cases. Where it can be done with safety, it looks to me as though it is the only sane way to do.

Col. Fabyan: Doctor, is that the explanation for the shipment of the 9,000 cattle from Peoria?

Dr. Melvin: Yes, I suppose it is.

Col. Fabyan: And for those that were affected, and that were killed in the sheds before they left?
Dr. Melvin: Several hundred were killed.

Col. Fabyan: Going through our pastures with the wind blowing, isn’t there danger of infection?

Dr. Melvin: Well, I personally know nothing about the local conditions of this shipment. I know that there was a large number of animals there, and that a great many of them were shipped up here and slaughtered, only those that appeared normal being shipped. Now as to local conditions, and danger of exposure, I don’t know, I can’t answer that, because I am perfectly ignorant of that phase of it.

Dr. Hughes: Mr. Chairman and Gentlemen: I have a little hesitancy in speaking on this subject of the quarantined dairy herd at this particular time, more especially as we are about to conduct a test of the cattle, and this test, I might state, is being brought about by the owners themselves, the Federal Government, and presumably the state. We all want to know just what we have got.

It appears to me that it is particularly opportune that I might say a word or two, in explanation of my position in this matter. I have been asked by a number of people, probably a dozen: “In your connection with these dairy show cattle are you not at variance with the Federal people?” I said “No, No, I am not in any way. We are just as friendly as we ever have been.” “Are you at variance with the state?” “No, we are not.” The state is satisfied with what we are doing, has agreed to the holding over of these cattle. The Federal people have agreed to the holding over of these cattle. The consequence is that it looks like a fair proposition all around.

While I am on my feet it might possibly be well to disabuse the minds of those who are here in regard to the condition of these cattle since I was first assigned to take charge of them. I am being asked constantly, not only personally, but in newspaper articles, as to whether many of these cattle are not dying nightly and being towed away and buried under the ground.

Now, gentlemen, if you will bear with me for a little while, I will give you a little history as to my connection with these cattle.

On November 6th, I was requested by the owners to come into consultation and have a meeting with them at the Stock Yards Inn. It was intimated to me what the nature of my meeting with them would be. I was already connected with the state, in fact I was working in consultation with Dr.
Dyson. Before agreeing to take any step in that direction I took the matter up with Dr. Dyson and got his consent. He said: "I will have to deal with somebody in this connection, and I would just as soon deal with you as anyone." I was not satisfied with that. I called up Dr. Bennett and Dr. Bennett said: "You are a pretty good kind of a fellow, I will agree to handle this bunch of cattle with you." I called up Washington and wanted to know if they would have any objection to letting these animals live. What I wanted to get from Washington more than anything else was whether they would have any objection to letting these animals live, considering that destruction was being dealt all around to the others. Washington told me to go ahead.

Well now, that is my position. What did I do? I did nothing. I just watched and supervised these cattle a little bit, and gave some instructions in regard to cleanliness and ventilation and feeding, and that is all. The result was that all of these 758 magnificent cattle, the pick of the country, cattle that it has taken scores of years to get to the perfection that they are in, at the end of six weeks were all recovered, and that there were no symptoms of foot-and-mouth disease present.

I stated that I took charge of the cattle on the 6th of November. On the 12th of December, the last lesion of foot-and-mouth disease was observed by me on the nose of a cow. Since that time I have not seen any evidence of foot-and-mouth disease among these cattle. I have, if you please, seen lesions, seen conditions that would develop, naturally develop where you collect 750 cattle together and house them in close quarters and not let them out of the stall, and feed them with feed that perhaps they were not used to having, and keeping them there under conditions they were not used to. I have had my own troubles. At the end of the first six weeks we lost only one adult animal, and that animal died of endometritis, contracted following calving. During the time the disease was at its height we lost suckling calves and cows that were giving milk. We had no means at our disposal for sterilizing milk, and it was a question of being confronted with a disease that was looked upon as of a very serious character, but we thought we would take a chance on the calves, and the calves died. We lost a very considerable number of calves, which is to be expected.

Meanwhile the animals progressed. We did not have any bad conditions, we did not have any enteric conditions, no trouble of that kind. From my profoundest reading I find, by
the way, that disinfection and cleanliness does not seem to have any particular effect upon the course taken by this disease, notwithstanding that we are having it dinned into our ears all the time. Malignant cases will develop under the most favorable circumstances and conditions for keeping it out, and the benign form will oftentimes take its course in the dirtiest, filthiest stables. Those people who are in the habit of seeing this disease know this to be a fact.

As I stated, at first the calves died. Eventually there came a period when, after December 12th, the calves commenced to come living. We had some abortions, or, if you please, not abortions, premature births. Possibly they might have come a week or two ahead. That is to be expected when we have a temperature running up to 105 or 106. We have it in influenza; we have it in a majority of other infectious febrile conditions. Eventually, though, the calves commenced coming living and healthy. And as time passed on, these calves grew up thrifty and healthy, and they were allowed to suckle their mothers. The cattle that were in bad shape and lost a little came back in a most rapid manner to their own original condition, so that some of the owners said: “I wish my cattle looked as good as that in their own native home.”

We decided to move from the Stock Yards, and we moved to Hawthorne. Before leaving for Hawthorne we lost a bull. This bull died of symptoms that were in no wise related to this disease. There is no man in this room or outside of this room that can say that any of these animals died of symptoms similar to those of foot-and-mouth disease, absolutely not, except in the case of the calves. After a most thorough post-mortem examination of this bull it was found that there was little wonder that he died. Really, I made a diagnosis of tuberculosis, in which I was wrong, I feel that I was wrong. Why? Because it was found that that bull was badly infected with a form of infection that has not been determined. Why has it not been determined? Because of the fact that the Government order reached us that on no account should any specimen be taken or should any examinations be made; notwithstanding that we have facilities for using the microscope, etc., no examination was made. But here was a bull that showed innumerable abscesses. These abscesses were distributed in the kidneys, were distributed in the spleen; they were to be found in the heart muscle, lots of them. They were to be found in the lungs. These abscesses upon being opened were found to contain a greenish pus. Now on a microscopic inspection the question arose as to how many or-
ganisms could produce green pus. I know they are very few. I know a foot-and-mouth organism does not produce green pus, or pus of any other kind. I might state that at this time some of the bulls became very lame, the heavier animals. We found that the soles separated. In other words, in these great, heavy animals, standing on their feet, the sensitive core became inflamed within the horn box, and this was especially true of the soles of the forefeet, and after a while the separated sole became a hard, solid, detached mass, and the animals got so they couldn’t stand. It was just a question of laying down those bulls one after another and taking those soles off, dressing the feet with a little tar, and oakum pads, and in three or four days they were walking out in a natural kind of fashion. That is about the only treatment these feet received. And that had to be done in the case of 32 or 33 bulls. Several of them were operated on more than once, I might say, because of the fact that it was impossible to make as thorough a job of it as we would have liked to. And more especially is this so, as cattle people are not accustomed to seeing blood, and if you drew a little blood they thought the animals were being bled to death; they thought their lives were being taken. The consequence was that we had trouble. We did not have any trouble excepting in one case, and in that one case a necrosis organism got in through an open ulcer. You know what the necrosis organism is. You don’t have to take a microscope to discover it. He ran around in that condition, but he was under control, and is sound and with a normal foot now, notwithstanding that he was a little lame.

As I said, we moved to Hawthorne from the Stock Yards. We got the old race track out there, or a portion of it, for the purpose of keeping these cattle. We got the grand stand, fenced it in and made out of it an admirable place for the accommodation of these 750 cattle. The death of calves reduced our number from the original higher number to 731, so that in reality we only brought 731 animals to Hawthorne. On arriving at Hawthorne we discovered that we had a concrete floor, covered with ice, and we had to put in salamanders to heat up the place; we had to go to work with pick and shovel and take the ice off that floor, and then erect stalls upon it, and eventually we got the cattle in there. Well, now; I don’t know how you gentlemen may feel about it, but I don’t feel very good about it, I must say, because here in this climate we cannot put animals on concrete, and the question of putting in floors over this concrete came up. It was a question of whether we were not confronted with rheumatism and
other conditions in such a place. There was no heating apparatus. But notwithstanding that, I am glad to say, since we have moved to Hawthorne we have lost but two other animals. Two animals in about six weeks, out of 700, and I don't know how many more, because we have had a great increase in the number of calves; and by the way, the calves are all living and in the most perfect condition conceivable. Well, after we moved to Hawthorne we got these two cases. One was an animal that went down from no apparent reason, somewhat the same as the bull. That animal would not get up. It remained down for three or four weeks. We destroyed her and held the most careful post-mortem examination. We found six feet of intestines with a bacterial infection, and we found the gall bladder with a bacterial infection—an infection that you will see on the farm, that you will see in the cow, that you will see in the calf, in scores of other diseases incidental to the farm. It is to be wondered at that we did not have two dozen instead of two, go the way they did.

The second one was taken down with somewhat similar symptoms, that is, paralysis. That cow was posted a week ago last Wednesday. In this cow the spinal cord was laid open from the brain to the tail, the spinal cord was picked up and it was found to be in a sclerotic condition, affected with hardening. You could take it out and hold it in your hand and it would be stiff; the nervous tissue of that cord was in that solidified condition. Now, remember, that cow was down three weeks, and no data about that. The lumbo-spinal fluid was perfectly clear. The lumbo-sacral plexus, the nervous fibers were white; in fact the meninges of that cord presented a peculiar pallor notwithstanding the fact that the cow was not bled to death. We laid open the abdomen, and the first thing we saw was the intestines come out severely inflamed. Well, to make a long story short, the only organs that we found affected were the intestines, the intestinal tract. You may tell me that the bacterial infection of the intestinal tract was foot-and-mouth disease, but I won't believe you. I say you have got to prove it to me, you may tell me that such an animal on a farm will distribute disease. I don't believe it; you have got to prove it. And, gentlemen, the proof is coming very soon. We have got fifty cattle at the present collected in Iowa. These cattle are supposed to come in, they will be in quarantine, and will be turned in among these animals that are out at the Hawthorne race track. Now, there is a simple exposition of the facts. It may be that we will have fifty cattle with the most pronounced symptoms of foot-and-mouth
disease. If we have, you will have learned something, you will have learned something that you don’t know now. You have never seen this disease run its course. You have never handled this disease in any other way than with the pole-ax or with the shot-gun. I have seen this disease in other cases than this, I have seen it run its course, watched the effects, and have drunk the milk of cows affected with it. And why? Because the laws were so lax, and precautions were not taken.

I will leave the matter there. These cattle are still out at Hawthorne, and are in very good condition at this time. (Applause.)
When I received a notice from Professor Ferguson that I would be asked to address this Association on the subject of "Recent Developments in Tick Eradication" I said: "There is a joke in this—there is surely a joke in this proposition. There are no recent developments in tick eradication." What we know today, and practice today, is the thing we have known and practiced for a good many years, and we know it is successful. There is no question about it. There is no longer any need for investigations in regard to the methods of control or methods of suppression of tick infestation. We know that if we employ the simple remedies that are available, that we have been using—that is, the regular, systematic disinfection of the cattle—we know that we will be successful in each and every instance. There isn't any question about it. So I concluded that they had a joke up their sleeve somewhere. But after thinking it over seriously, and knowing that Ferguson was not a man inclined to joking at such a time as this, I said to myself: "There is something he has in mind. What can it be?" And I finally came to the conclusion that it was not the recent things that we had done that should be discussed, but the many things that we have left undone, or the many things that we ought to do in order to succeed in tick eradication work, and that we have not done, and the chief among those things is that we have not suppressed the movement of tick-infested cattle.

Now there was a time when the movement of tick-infested cattle was fully justified. We did not understand how to handle the situation. The dipping vats were not in use and at the time we were using the oil emulsion we had a great deal of trouble in the dipping process, and many times the ticks were not killed. If the emulsion was not perfect we found some cattle carried out too much oil and some had only a water bath, and yet in those times I can see where the Federal regulations permitting the movement of tick-infested cattle was justified. But today, with the arsenical solution (and we have had it for five years now) there is absolutely no justification for movement of tick-infested cattle. I take the position that no man, I do not care who he is, can hope to eradicate the tick from the United States by bringing the animals to the packing houses and killing them. It cannot be done. There is only one place to eradicate the tick and that is on the farm, and the farmer or the rancher—and I don't care whether he owns a thousand cattle or one, the same principle applies—the man that owns the cows is the man that must kill the tick. Any effort made by anyone, or any laws or rules or regulations that offer an opportunity for a man to move tick-infested cattle are handicaps and drawbacks to the work of tick eradication.

Having this in mind I want to say that the one thing—and this is not necessarily a recent development—the one thing that we must do now is to provide special laws that absolutely prohibit the movement
of tick-infested cattle. When we do that we have the machinery with which to clean up the work and complete it in not more than ten or fifteen years—absolutely complete the work. Continue the same movement of tick-infested cattle interstate, as is permitted now, or intrastate as it is in some states, and you will find that the work of tick eradication will drag along for many, many weary years. Many people know that they ought to eradicate the tick; they know that they ought to disinfect their cattle, but until they are forced to do it they won't take it up.

There is absolutely nothing new in regard to tick eradication, as I said; but our people (that is, the Southern people) in the tick-infested belt take a very peculiar attitude towards the work of tick eradication. They grew up among the ticks, and among the ticky cattle. They have seen them from the time they were old enough to observe anything and they really believe in many instances that the ticks do not injure cattle. They really believe that their cattle die from other causes than from tick infestation. You cannot go anywhere in the tick-infested belt but you will hear them discuss such diseases as “hollow horn” and “hollow tail,” and the “stumper,” and other diseases among cattle. But the great trouble is that the public cannot be trusted in the naming of diseases.

That is best illustrated by a little story that I heard a good many years ago. In a small town the hotel had an Irishman for porter named Mike, and he met the trains regularly on all occasions. Among his special cronies was a drummer by the name of Miller, who used to come to this town occasionally, and on this particular occasion when Miller gets off the train Mike rushes up and gets his grip with one hand and extends the other hand for a shake and says: “How do you do, Mr. Miller.” Miller said he felt bad, bad. Mike said: “What's the matter?” “Why,” he said. “Business is dull; we had two or three wrecks and a couple of wash-outs on our last trip, and I only came home last night to find my wife in bed with cerebro-spinal meningitis.” The Irishman dropped the grip and said: “Oh, the Italian son-of-a-gun! Did you kill him?” (Laughter.)

So we can not trust the public in the matter of nomenclature.

Now we know that the one principal disease of southern cattle is tick fever, caused by tick infestation. We also know that barring that one disease southern cattle are exceptionally healthy. It is a matter of record that at the slaughter house at Moultrie less than one-quarter of one per cent of the cattle killed have shown tuberculosis. In fact, the condemning of whole carcasses is a rarity. Of course we know that worm infestation, especially in hogs, even in cattle, is sometimes excessive, but the condemning of whole carcasses is a rarity. So with that knowledge before us, why tick eradication assumes, as far as southern conditions are concerned, the one great, gigantic task before us.

We believe that each and every man in the North is interested in tick eradication. It is difficult, of course, for us to make him see it. We believe that every breeder ought to be interested in the eradication of the cattle tick. If they could only realize what it would mean to them, if they could realize the commercial opportunity before them in selling to southern states cattle for breeding purposes after the ticks are eradicated, I am sure they would take a vital interest in tick eradication. I am also sure that if the railroads and the packers could realize what it would mean for the southern states to complete the work of tick eradication and help produce the food supply of the nation, they would all take a different view from what they do now.
In my opinion this Association should again (I say "again" because we have done so in the past) go on record that the specific act of Congress which makes it possible that tick-infested cattle be shipped interstate should be repealed. It is an old fogey idea and it ought to be eliminated. It is a disgrace to the sanitary knowledge that we have now-a-days. We know that we can absolutely ship cattle free of ticks. We know that it is not essential to ship tick-infested cattle.

Now just one word in regard to intrastate conditions. We know that the states themselves are vitally interested in the eradication of the cattle tick. But, as in every other measure, and as some of you people have discovered in your effort to eradicate foot-and-mouth disease, it requires co-operation all along the line, and before you can get co-operation you have got to open up a campaign of education. The man who is expected to co-operate with you must have a reasonable degree of understanding as to what you are driving at.

So that we virtually classify the local work, that is, the state work, into four groups. First, education; second, co-operation; third, quarantine restrictions. And I want to emphasize that good and strong. Without quarantine restrictions—without properly enforced quarantine restrictions—you cannot succeed in tick eradication. I doubt, seriously, if you would succeed in the eradication of any disease without properly enforced quarantine restrictions. Then, in addition to that, comes disinfection.

Now, first of all, in the matter of eradication we find that it is difficult, as I said in the beginning, to get people to come out and listen to us talk about tick eradication. It is such a small and insignificant subject to talk about that they really get tired of it. To begin with, it used to bore me to have to talk to the empty benches, but I rather like to talk to myself now-a-days; I have been doing so much of it that it doesn't embarrass me a bit. It is a good thing to talk about, even if you don't get any audience at all.

Tick infestation costs the southern states each and every year not less than $150,000,000. Not less than $150,000,000. The losses are so enormous that if we had not been made accustomed to this great loss regularly every year we would not stand for it a minute. You talk about the losses sustained because of foot-and-mouth disease. Your losses, great though they are, are insignificant compared with the annual losses sustained by the southern states on account of tick infestation. There is a heavier death rate among tick-infested cattle than there is among the cattle infected with foot-and-mouth disease. I want to emphasize that. And that is the smallest loss sustained. That is the smallest loss. The one big loss we sustain is the economic loss. Every milk cow infested with ticks will give anywhere from a quart to as much as a gallon less milk than one that is not infected with ticks. If they are infested with ticks they will not recover their normal milk flow again until the next period of lactation. That item itself (and let us place it conservatively at a loss not exceeding $15 a head on each and every milk cow) will make an item in excess of $75,000,000. That is the loss at the milk pail for the southern states—$75,000,000.

Every man that knows anything about ticks and tick infestation, knows that when your cattle become infested with ticks they get poor. It does not take a Philadelphia lawyer to discover that. Good common sense and a reasonable degree of observation will force any man to recognize that the cattle get poor. They get thin in flesh, and as your
cattle are thin in flesh you have to sell them for less money. Isn't that simple? Perfectly simple. You have to sell them for less money. You lose in weight, or as I have often heard said, "You lose in pounds and you lose in pennies." You lose in pennies per pound. The reason the cow is impoverished is on account of tick infestation. Now, then, it is a certainty that the difference in value between a poor cow, infested with the tick, and the value of the cow if she were not tick-infested is conservatively, even with our scrub cows, $5 a head, and on that basis we lose not less than $45,000,000 or $50,000,000 in that one time. Fifty million dollars—and just on that one item.

Now then, those two items in themselves more than justify any expense the state or Federal Government might go to in order to eradicate the cattle tick. But as I said, the one stumbling block that we are up against in enforcing state regulation is the fact that the Federal regulations will permit the movement interstate of cattle infested with ticks. The minute we begin to draw a tight line on local shippers they will say, "why, we can ship to St. Louis, we can ship to Chicago, we can ship to Louisville, or any of the other markets interstate. Why can't I ship Georgia cattle within the State of Georgia when they are tick-infested, if they will let me ship them to other states?" And you can not make them understand. Now I believe that a resolution coming from this Association asking that Congress amend the Act of 1888 by striking therefrom the clause that permits the transportation of tick-infested cattle would materially benefit the southern states, and would be one of the greatest advancements toward the completion of tick eradication in the South.

I don't think of any other point that I want to bring up right now, but in all probability I will think of some other point after the discussion is over. (Applause.)

Dr. Flower: Mr. President, I haven't anything to add to what Dr. Bahnsen has said on this subject. We are thoroughly in accord with his statement almost in toto. I come from Louisiana, one of the extreme southern states, and of course it is infested with ticks and has been for all time, but we are beginning to see daylight ahead of us in our work down there, and feel positive that in the next five years, or six years at any rate, we will be entirely free from this obnoxious pest. When I made the statement last year on the floor of this convention that the State of Louisiana would be free from ticks in the next eight years, that statement was received with a little ridicule, but when I mention the fact that we are working this year in 19 counties, jumping from three to 19 counties at one time, it looks like the work is certainly going toward an ultimate substantial and successful termination. As far as the interstate shipment of the tick-infested cattle is concerned, it does work a hardship, and I think it is a subject that could be discussed with very material benefit.

Mr. John Schueler: I would like to ask Dr. Bahnsen to what extent would it benefit the middle west or the western states if the southern states were cleaned up, and the ticks
eradicated? To what extent would it benefit the middle western states to ship their fine stock into the south?

Dr. Bahnsen: I want to say that tick eradication will benefit everybody. It will benefit every man, from the producer of scrub cattle to the producer of high-grade, pure-bred cattle. And it will also profit every man from the producer to the fellow that eats the meat out of the can, the final consumer. Every man pays a tribute to the cattle tick. If he patronizes the tick-infested cattle in any way he pays a tribute to the cattle tick. The producer cannot possibly produce the kind of animal that he would if his cattle were free from ticks, and the buyer is not able to give as much for tick-infested cattle as he would be able to pay for cattle that were free from ticks. The commission man will make a smaller commission on the sale. The packer will make a smaller profit, and ultimately the consumer will pay a higher price than would be necessary if the cattle were free from ticks. Everyone loses, and no one makes a penny out of it.

It is of special interest so far as the breeder of pure-bred cattle is concerned. We hear a great deal of talk in the South that you cannot ship northern cattle south; that they die from the "stumper" or acclimation fever. There is not a word of truth in it, not a word of truth. You can ship cattle from Iowa, you can ship cattle from Washington or from Canada or from any other state or territory any time of the year, winter or summer, and if you will keep them free from ticks they will not die, excepting, of course, from some occasional disease that that is likely to attack them in any climate or under any conditions. But there is no specific disease in the South, except tick infestation, that is disastrous to the cattle industry.

Dr. Connaway: Mr. Chairman, you may recall that several years ago Dr. Francis of the Experiment Station of Texas, and I, at the Missouri Experiment Station, co-operated on the working out of a method of vaccinating northern cattle so that they could be shipped into this southern country, and a great many cattle were vaccinated against Texas fever, that is, they were made immune, immunized by taking the young cattle and injecting them with the virus of that disease, and thus making them more resistant, so that when they were shipped into the southern country they would not die of Texas fever. We pointed out, though, that the ultimate solution of this matter was the eradication of the tick, and that this was simply a temporary expedient which was useful, and which Dr. Francis at the present time is employing, for the benefit of the
stock raisers, in many parts of that state. But the ultimate solution of it, of course, is the eradication of the tick, the carrier of the infection, and we never could hope by means of the hypodermic syringe and the virus of a Texas cow, to control this matter. And so I am glad to see the progress that is being made in Dr. Bahnscn's state and in these other states, in getting rid of the infection itself, in getting rid of these carriers, so that ultimately these cattle will grow up really susceptible to the disease, but won't take it, because you haven't the infection in the country. That is the solution of many of these problems that we have before us in the eradication of infectious diseases.

One of the things that will help Dr. Bahnsen down in his country, and in other sections of the country, is to go after the farmers on the proposition as a matter of business; not to approach them with the thought in mind only of the eradication of the disease, but the building up of the industry. If you will associate with you, as I know Dr. Bahnscn does, the animal husbandry departments of the colleges, and let them boost the upbuilding of the industry then you can't get a cow out of the area. You go out with a program of: "How can we increase the number of pure-bred stock in this county?" A lot of them will prick up their ears and come out. And then as an incident to this you can work in this tick eradication, because they will see the close connection between the eradication of the disease and the upbuilding of the industry. We must look at these things from a broader view than simply that of the veterinarian, from the point of trying to get rid of the disease. We are servants of the live-stock interests of the country. (Applause.)

Dr. White: I want to say a few words, if it is permissible, and I presume that all present understand at the outset, that Tennessee is not in Georgia's class, when it comes to tick infestation. We in Tennessee are in the same class as the people are in Maine, and in Michigan and Montana and other tick-free states, because tick eradication in the State of Tennessee has been completed. We eradicated the tick in fifty-one counties of Tennessee. We are now above the Federal quarantine line, and there are only one or two scattered quarantined farms in the state at the present time.

Dr. Bahnscn is absolutely correct in his remarks in regard to the movement of tick-infested cattle. There is no doubt in our minds that the more rigid the quarantine restrictions are made for the movement of these tick-infested cattle to the markets of the North, the more progress can be made with
tick eradication in the South. Just so long as the markets of
the country are open to tick-infested cattle, then just so long
will the people hesitate in going to the expense and trouble of
eradicating the tick. But tick eradication is making good and
rapid progress. It is on a firm and substantial basis. There is
no way for any backward step to be taken, and it is only a
question of time and money and men until tick eradication
will be completed in this country.

Mr. W. A. Wallace: Mr. President and Gentlemen: As
chief inspector of the Live Stock Sanitary Commission of
Texas, I feel that I may make a few remarks, and I will make
my remarks from data that I have compiled in regard to con-
ditions in our state.

The total area of Texas is 262,290 square miles. Of this
area 96,000 square miles are above, and 176,290 square miles
below the Federal quarantine line. Of this 96,000 square
miles of territory above the Federal quarantine line, 27,000
representing twenty full counties and three parts of counties,
have been released from quarantine on account of tick infe-
tion since 1906. Really, that represents the area that has been
released from tick infection for the last four years, as prior to
that time there was little eradication work done in the State
of Texas. Nineteen hundred and six was the year that active
tick eradication was started in Texas, and this 27,000 square
miles that has been freed from the tick, represents approxi-
mately 700,000 head of cattle which have been released from
quarantine on account of the efforts of the state and Federal
governments in eradicating the ticks, thereby increasing the
value of these cattle at the lowest estimate $5 per head, which
would make a total of $3,500,000. But I think that is far too
low. I think the increased value of these cattle would be
nearer $10 per head, which would make the total increased
value $7,000,000.

Due to the difficulties encountered in breeding cattle in
the tick-infected area, the stunting influence of grass tick in-
festation, etc., the average animal below the line is inferior in
grade, amounting to at least $5. To this loss in grade may be
added the additional loss of $5 per head on account of
restricted market privileges, that being the approximate reduc-
tion the northern buyer makes for the risk, trouble and delay
for double dipping requisite for taking cattle outside of the
quarantined area. These two factors take a toll then of $10
per head, which on the 5,000,000 below the line, amounts to
the stupendous total of $50,000,000. That is, the 5,000,000
head of cattle below the quarantine line in Texas are worth
about $50,000,000 less than that number of cattle should be and are worth outside of the quarantined area. Half of this loss may be charged to the inferior grade and the other half to the restricted market. That is not all. Were it not for this blight caused by the tick, the South would be a cattle raising district where two $70 cows and two $30 calves at present prices, would be growing where one $35 cow and one $15 calf are now grown. I think that perhaps that estimate is too low, and that today the market valuation of a cow is $50 with a $30 calf by the side of her.

The land on which such cattle could be grown were it not for the tick, would be increased in fertility; green pastures would be seen where eroded cotton fields now obtain. Who would say that fertile fields, made so by judicious crop rotation which is possible only in connection with stock farming, would not make the land of the cotton belt of Texas worth $10 per acre more than present prices? Who would say that the 8,000,000 acres of land in the cotton belt of Texas would not thereby be enhanced in value at that rate to the total of $80,000,000, and the million homes made infinitely happier by the pleasurable pursuit of raising fine cattle, hogs and sheep, the rotation of crops, adding to instead of depriving the land of its fertility? Compare this, if you please, with the drudgery of the cotton patch. The condition that gave rise to the recent popular demand of "Buy-a-Bale" should have no place in the fair State of Texas with its natural advantages and resources. Eradicate the tick. Give your cattle and other live stock a chance to pull us out of this condition of despondency which cotton farming has brought us. A well known agriculturist has aptly said "Buy-a-Bull" as a parody on "Buy-a-Bale." Not each one of you necessarily; but a good bull and no other should be in each community. Before buying him eradicate the tick, which can be done in a single summer upon any ranch or farm. What may be done by one may be done by a whole community or group of communities with proper organization.

In Texas the farms are considerably larger than in any other state in the country, as we have such vast areas down there, and some of our farms, or ranches, as they are more aptly called in that country, are from 50,000 to 150,000 acres in extent. And in some parts of the country, especially in the lower part of the quarantine line it is very brushy, and the cattle are wild and they are hard to get hold of. Consequently it is harder to eradicate the tick there than on the small farm. In some instances there we have eradicated the tick by dipping as little as five times, but usually it takes from five to
seven times. Those who have been in the work of tick eradication know that cattle should be dipped during a period of at least from eighteen to twenty-one days, and that it should be kept up, no lapse between the times of dipping.

We have found that a great many of the people are opposed to dipping simply from prejudice and ignorance. But I am glad to say that that is being overcome.

Last year there was a greater loss of cattle in Texas than in any year, I think, in its history, on account of the fever tick killing the cattle. In some counties the loss from tick infection has been as high as twenty-five per cent—that is below the quarantine line. Counties that we have released from tick infestation in the past four years, representing 24 counties, have had no loss from ticks. When we release a county, in conjunction with the Federal authorities, we are on the safe side.

But the state law that we have today is not as strong as it should be, because there is a local option feature in it that says that the county shall vote on tick eradication before taking it up. In other words, 75 resident land owners of that county can get up a petition petitioning the county commissioners of that county to order an election. Then it is put to a vote of the people, that is, the farmers in the county can vote on it, and we have found that the pernicious traders and the farmers who are not in touch with eradication work, or who are prejudiced against that work, or who are ignorant, usually defeat the proposition. We have before the legislature today a bill which we hope will do away with the local option feature, giving the Commission complete control to take any such counties or block of counties as the occasion demands and to compel them to take up this work. In other words, we propose to take in a block of counties, some four or five counties in a square, or adjoining the quarantine line, and compel the work of tick eradication to be taken up. By doing that we feel that we will then be able to do good eradication work, and I believe the time is coming when the State of Texas will see that it is absolutely necessary to eradicate the tick. In fact I know the time is coming; the time is right here today.

Take for instance the black belt of Texas, which runs east and west; more cattle have died in that country this past summer from tick infestation than at any other time in the history of cattle raising in Texas. Why? Simply because we have had a protracted series of droughty years down there, and the tick has nearly died out during these droughty years,
but since we began to have rain in the latter part of 1913 and in 1914 they have reappeared. We have had more rain in Texas during the last year than ever was known down there before. In some places we had as much as sixty inches in an area where the rainfall usually amounted to 20 or 25, and there were enough ticks left in that country to propagate and cause fever. Also, the grass was very abundant last year, but the people had run out of cattle, they had sold their cattle, and so they went to the Fort Worth market and the Oklahoma market and bought ticky cattle and shipped them back to their ranches, and the result was they lost heavily, some places losing as high as ten, fifteen, or twenty per cent.

I have here a letter from a man in Schleicher County, a county that took up tick eradication in the fall of the year before last. That county represents an area of about 1200 square miles, and the county voted on the proposition and carried it five to one in favor of tick eradication, but this past year, owing to difficulties on account of the rains, we have not succeeded in releasing it, though we will release about two-thirds of that county this year, I think. He says:

"Concerning the eradication of ticks, I think it is the only thing. As you know, this was a very wet year, and ticks spread very fast. We began dipping early, and many of us dipped eight times, yet our cattle are fat. In fact, I have looked at a lot of steers recently and the steers that were dipped were in as good condition as any undipped steers I have seen of the same age.

"A dry year I think any man can clean with four or five clippings. I think that all the people in Concho County who have a good grade of cattle should be glad to clean up. Then they can get north, and there is where there is a demand for good grade stuff to feed.

"If you people of Concho want to clean, and I can assist in any way, it will be a pleasure. My loss in dipping 800 head (8 times) was one grown cow and one calf."

Dr. Bahnsen: I want to say that the method mentioned by Dr. Connaway, of immunization, is a farce. We know that there is no such thing as absolute immunity against tick infestation. Of course we know that the organism that produces tick fever will sometimes be tolerated under certain favorable conditions by quite a number of cattle, but if for any reason, as the result of exposure, underfeeding, or for any other reason, the animal loses his constitutional vigor, we find that he dies of tick infestation, or rather, of tick fever, even though he has a heavy degree of immunization. If you take immun-
ized cattle and send them into pastures where the infestation is heavy there is a certain per cent of dead loss even among your immunized cattle, to say nothing of the fact that some of your cattle die as the result of immunization. Now we know that one thing which has been a big handicap in the course of tick eradication is this idea that people could immunize their cattle and then would not have to be afraid of sending them into the tick-infested area. Every tick-infested cow means a loss to the owner of that cow, regardless of whether she was immunized or not. There is nothing like the eradication of the tick. It is the only solution. Immunization is not worth considering.

Dr. Connaway: I heartily approve the remarks that Dr. Bahnsen has made, because I have seen even old well-immuned cattle, that is, cattle raised in the southern states, that had become mature and were well immunized, I have seen them die from Texas fever, where they had been put on long drives, or where they had been dipped in hot weather or in cold weather. It is a matter simply of resistance in this case, because they carry the germ with them; it is a matter of tolerance. And as Dr. Bahnsen says, eradication is the only solution of the question.

THE USE OF CONCRETE FOR SANITARY FARM IMPROVEMENTS.


Today the farmer who is contemplating building various farm structures or making other improvements must take into consideration the factors of permanency and sanitation. Legislative measures are being passed from time to time providing for and enforcing sanitary methods around the live stock farm. Science long ago proved that "prevention is better than cure," and enforcement of measures that tend to promote sanitation has probably been responsible for reducing disease to a greater extent, especially as regards communicable diseases, than has any effort which has been made by agencies such as drugs or disinfectants.

In taking up the discussion of the construction of farm improvements as it relates to sanitation, I shall confine my paper to the following:

Buildings and improvements: First, the dairy barn and milkhouse. Second, feeding floors and hog wallows.

Dairy Barn.

Let us first consider the plan and general arrangement of a sanitary dairy barn. Suppose we were in search of information concerning the plans and arrangement of dairy buildings. We would come in contact with the enthusiastic herdsman who is after a record for his cow, with no other thought than the quantity of milk; with the veterinarian who cares neither for milk nor milk production, but is concerned only with the health of the animal; with the bacteriologist, impressed by nothing
but the things he feels are necessary to give a sterile sample of milk. Then we would have a talk with the farm superintendent who perhaps takes no special delight in milk production or scientific hygiene, but whose first thought is for the arrangement that will permit the work to be done in the easiest possible manner. Then the owner, who though perhaps taking into consideration all of the above, regards cost as a big factor, and naturally turns to building materials near at hand. If he has suitable sand and gravel on his farm, concrete construction is likely to best suit his needs, and he should consider himself as lucky as though he had a gold mine. All of these various views should be taken into consideration in planning and constructing any farm building or permanent improvement, but the net results in which we should be most interested at this time are permanency and sanitation.

The building for a sanitary dairy need not be elaborate nor expensive, although it should be so arranged that the work can be done conveniently and with the least expenditure of time and labor. Designers are constantly devising new and better methods. Only those who have had to work on a dairy farm realize how much time can be saved in doing the daily chores if the barn is properly arranged to save unnecessary steps in milking and feeding, and to save hard work in cleaning out manure. The dairy industry today is surrounded by many legal restrictions and stringent regulations. These are not only beneficial to public health, but when enforced, also to the business conducted along proper business scientific lines. A few years ago under the old conditions, farmers kept the cows, but today we are trying to make the cows not only keep the farmer, but pay a nice profit on his investment. Dairymen should not wait until compelled by state and federal authorities to clean up, but should practice such measures as part of their business.

In order to show what a large part proper construction and equipment of a dairy barn plays in the dairy business, consider the following points: It is a recognized fact that the dairymen with sanitary, well lighted, well ventilated, and well equipped dairy barns are making the largest profits and obtaining higher prices for their products. The care and stabling of the cow is probably just as important a factor and has as much to do with her milk producing ability as proper feeding.

The first thing to consider in constructing a dairy barn is the location. In deciding upon the location, of course, there are two governing factors to be considered—the topography of the farm and the relation of the dairy building to the other farm buildings. Drainage is a very important factor and many times determines the choice of the building site. The barn should be so located that the prevailing winds will carry the stable odors away from the house. The best exposure for the cow barn is undoubtedly with its long axis northwest and southeast. This places the building so that it will receive the greatest benefit from the cooling summer breezes and the warming winter sun. Windows should be large enough and numerous enough to be effective both for light and ventilation. The source of water supply must be constant and free from contamination, and this fact should not be overlooked in choosing a site for the dairy barn. A cow will consume about six gallons of water per day; hence forty cows will require at least 240 gallons, and it would be necessary to have a well or other suitable source that would supply over three hundred gallons of good, pure water.

The material used for the interior surface of the cow barn is so-
lected with a view toward elimination of all wood. Requirements for sanitary construction of farm buildings make concrete the most useful material for floors and walls, as well as for roofs and ceilings. No other material possesses all of the desired advantages for general dairy construction in the same degree as does concrete. Wood construction decays, and being naturally permeable, absorbs and retains filth, thus serving as a breeding place for germs. Probably there is not a dairy farmer or stock raiser who has been one of the victims of the recent cattle killing made necessary by the foot-and-mouth disease, who does not now realize how small a portion of his loss in stock would have completely equipped his place with permanent and sanitary improvements. Most all boards of health and sanitary associations, which undertake to regulate the production of milk sold under their jurisdiction, require or advise the use of cement for floors in cow stables, and also recommend and often specify that the walls and ceilings must be tight, clean, and free from dust-catching surfaces, which evidently suggests the use of cement or hard plaster surfaces. At present we still see most stables built of wood. Many are building the first nine feet of wall of concrete, but there are already a large number of barns scattered throughout the country which show in a highly developed way the best uses of concrete. The fireproof, permanent, and sanitary qualities of this material are powerful inducements toward its use. The ease with which concrete may be kept clean, the good health of the animals stabled in concrete buildings, and the possibility of producing clean milk with a minimum of labor all increase the weight of arguments in its behalf. It allows the use of a large quantity of local materials and requires only a small percentage of skilled labor.

Wood on the interior of a cow barn may be entirely dispensed with for doors and window sashes. In some instances where perfection has been sought iron window frames and doors have been installed, but they are generally too expensive for ordinary use, so that wooden doors and window sash seem to satisfactorily serve all requirements, even from the hygienic standpoint. Doors, however, are better if sheathed smooth on the inside than if paneled in the ordinary fashion. The idea of doing away with all dust-catching projections should be carried out to the smallest detail. Today lumber for many purposes has reached an almost prohibitive figure in cost, and the rapidly diminishing supply gives no hope of future reduction in price. Concrete is taking the place of lumber because, in addition to its other advantages, it is cheap and in every sense the most economical of home labor and materials. Under a competent man to oversee the work, otherwise unskilled farm laborers can readily be trained to mix and place concrete properly, while men skilled in carpentry are required to do the work on frame buildings. Most farmers have sand and gravel on their places, or can obtain it at small cost, and in many instances the only material which has to be bought outright is the cement, and there is hardly a common mixture of concrete that does not require more than five parts of sand and gravel.

There are two common systems of arranging the rows of cows in a long dairy barn. One is to have the cows in two rows facing out, with one litter alley in the center, and two feed alleys, one on each side of the barn. The other system is where the two rows are arranged so that the cows face toward the center feed alley, and the litter alleys are along the side. Personally, the writer favors the head-to-head
arrangement for the following reasons: It is more convenient to bring
the silage in at one place in the center than at the two sides, and in
general it will be found much easier to feed two lines of cows from
one feed alley. When the cows face in, the milkers are in the best light
and can see that the cow's udder is clean. This is a decided advan-
tage on dull days, while the arrangement brings the gutters next to
the windows where the sunshine will sterilize them. The length of the
cow stalls, of course, will depend upon the size of the cow. The average
mature Holstein cow, for instance, will require at least 4 feet 8 inches,
while 4 feet 6 inches will be plenty for the average Jersey cow. Three
feet 6 inches is the most common width allowed per head. Light and
ventilation are perhaps the most important factors in barn sanitation
and deserve careful consideration. At least 4 square feet of light per
cow should be allowed, and even 6 square feet would be none too much:
Sunlight is nature's germ destroyer, and such a thing as too much light
is impossible.

Ventilation must be so arranged that all foul air will be removed
without creating a draft on the cattle. The James ventilators are a
very good type. There are four sizes which have different capacities,
and the size used will depend upon the number of head of live stock to
be housed. For example, the 18-inch size is large enough for seven
horses or eight cows; the 30-inch size for twenty-four horses or thirty
cows, etc. Then by making a combination of two or three or even four
of these ventilators the required amount of ventilation can be secured
for any number of cows and horses. At intervals of 7 feet there should
be fresh air intakes in the wall, provided with registers that can be
adjusted to suit various weather conditions. Outside openings are
placed about 3 feet from the ground and the air is taken in and passes
upward through galvanized iron pipes placed in the walls and between
the floor and ceiling, entering the stable in front of the cows.

The ceiling of the first floor should be constructed of material that
will prevent dust and dirt from sifting through from the hayloft, and
concrete is undoubtedly best, as it also makes the stable fireproof.
This also adds greatly to the appearance and warmth of the basement
and prevents dust and cobwebs from accumulating between the joists.
There is hardly a farm in the United States where a more liberal use
of concrete would not result in a great betterment of sanitary conditions,
especially if used for dairy barn floors. All inside corners of concrete
buildings can be rounded to prevent the accumulation of dirt, thus
making the structures easy to keep clean.

Consider the ease with which a concrete floor, walls and ceiling
of a dairy barn may be kept in a sanitary condition. They may be
thoroughly cleansed by flushing with a hose. The milk from cows prop-
perly cared for in such a building is pure and wholesome. Contrast
such surroundings with the unsanitary conditions that are not uncom-
mon in the dairy barns in this country. In some extreme cases the
dairy barns have badly rotted wooden floors and walls which cannot be
kept sanitary. The condition of the barnyard also has a great effect
upon the purity of dairy products. Concrete floors show practically no
wear from use. They are watertight, non-absorbent, and sanitary, and
if sufficient bedding is used, make a satisfactory material for the ani-
imals to stand and lie upon. Many farmers are prejudiced against a
cement floor because they think it is cold, causing stiffness and rheu-
matism in stock and other troubles in cows. If sufficient bedding is
used, this objection is removed, and the good points of concrete out-
weigh all supposed disadvantages. In case a wooden floor is preferred for the stalls, a platform may be made of 2-inch oak, chestnut or spruce, creosoted to prevent absorption of urine.

The platform should be built in sections, one, or possibly two, for each stall set in a pan formed of cement so as to be readily removable for cleaning or renewal. When cleaning and disinfecting the stable these wooden sections can be washed with a hose and placed in the sunlight.

Feed mangers in front of the cow stalls should be low and of proper depth to allow for feeding, as well as watering the cows. Six inches is usually deep enough, and watering in this way at regular periods has proved satisfactory. It is often impossible to turn a large herd out to water from a trough in the yard, and the continuous manger into which water may be admitted from a hydrant provides an easy and cleanly method of watering; the water being shallow and the mangers the temperature of the stable, the chill is taken off the water even in severe weather, while the water in the yard trough, unless special means are taken to warm it, is often too cold for the cows to drink. Low mangers offer the advantage of feeding practically on the floor. The passage in front should be as high as the front of the manger so that any feed thrown out by the cows may be easily swept back within their reach.

The above discussion only takes up a few of the more important points to be considered in planning a dairy barn, and as there are several bulletins published by the United States Department of Agriculture, and numerous state experiment stations which take up the subject, I have not attempted to cover all details of dairy barn construction in this paper.

Next let us consider the requirements of a permanent and sanitary milkhouse.

**Milkhouse.**

There is perhaps no other structure on the dairy farm where concrete will better serve than in the construction of a milkhouse. Many health regulations provide, among other things, that milkhouses shall be light, clean, well ventilated, well screened and provided with a concrete floor and cooling vat.

Recent developments in dairying have caused a large demand for a milkhouse which will fulfill sanitary requirements and at the same time be practical and inexpensive. For those who are striving to improve the quality of their products, such a building is an absolute necessity.

While a milkhouse should be conveniently located so that the milkers do not have a long walk from the barn, it must be so placed that it will be free from all contaminating surroundings. It should be built on a well-drained spot away from the barn so that the prevailing winds will not carry the stable odors in its direction. If possible, the ground should slope from the milkhouse toward the barn, rather than from the barn toward the milkhouse. Thorough cleanliness must always be kept in mind; therefore, there should be no unnecessary ledges or rough surfaces inside the building, so that it can be quickly and thoroughly cleaned. Ventilators are necessary to keep the air in the milk room fresh and free from musty and other undesirable odors. In summer the doors and windows should be screened to keep out flies and other insects.
It is absolutely necessary that there should be a plentiful supply of cold running water at the dairy house.

For the proper sterilization of utensils, an abundance of steam or hot water is needed. A milk pail or milk bottle may appear clean to the eye and yet carry large numbers of bacteria which will hasten the souring of milk, cause a bad flavor in butter or cheese, and spread contagion.

It is not possible to submit a plan which will suit all conditions, but whatever plan is decided upon the above factors should be observed. Some very reliable information concerning the plan of a small dairy house can be obtained by securing Circular No. 195, published by the U. S. Department of Agriculture, Bureau of Animal Industry, and written by R. E. Parks, Dairy Engineer of the Dairy Division. Mr. Parks specifies that the building should have a good concrete floor, pitched to drain through bell traps, and he also advises the use of cement for walls so that the interior can be carefully finished smooth and free from corners or projections which might accumulate dust or dirt.

A milk house 19 feet by 20 feet in size, built of concrete construction such as described above, can be built at a cost of from $200 to $400, depending upon whether the farmer does the work himself with his own farm labor or whether he furnishes the materials and lets it out to a contractor. This type of construction would cost but little more than wood construction, and when we consider that there will be no up-keep expense, no fire risk, and that it would fulfill all sanitary requirements, the extra expense is justifiable.

Another permanent and sanitary improvement which has proved a paying investment is a concrete feeding floor.

Feeding Floors.

Several years ago corn was so cheap that in some sections it was burned for fuel. No consideration was thus given to the bushel wasted in muddy feed lots. If the mud became too deep, the feeding was transferred to the pasture. To be sure, the sod wore out, the feeding place had to be changed, and somebody had advanced the idea that this particular method of feeding was good for the soil. Many farmers had tried wooden feeding floors and had found them a paying proposition as far as the saving of feed was concerned. But the drawbacks were that rats infested them, that they were unsanitary, and that they needed constant repairing. In concrete, the thoughtful farmer saw the possibilities of an ideal floor—an easily cleaned, rat-proof, disease-proof surface upon which his hogs, sheep, cattle, and poultry might consume the feed, even to the smallest particle. Feeding floors are especially adapted for feeding hogs.

Wild ancestors of the modern hog roamed the forests untroubled by modern hog diseases, and dug their living from the ground. Today the hog is penned in a small lot. Inherited instincts cause him to root for food. Corn is thrown on the ground, trampled in the mud and much of it lost, even in good weather. Shortly the hog lot becomes foul, but is still used for feeding purposes; then diseases come and people wonder why.

Concrete feeding floors are advocated by the Government. Indeed, the United States Department of Agriculture has published, for free distribution, Farmers' Bulletin No. 481 on this subject. Rats infest the hog lot, and especially the wood feeding floor, but do not burrow under concrete. Moisture soon rots out the wood floor, but can do no
harm to concrete. Wood feeding floors can not be thoroughly disinfected, but water and disinfectants will keep the concrete floor in perfect condition.

Progressive farmers ascertain and remove the source of disease. Without sanitary improvements such as concrete feeding floors it is impossible to keep hogs free from disease. One of the finest examples of a concrete feeding floor is on the Brook Haven Stock Farm near Vincennes, Indiana, owned by W. R. Crackle. While the farm buildings are examples of sanitary construction they are not "de luxe" specimens such as some millionaire farmers build for show purposes. Mr. Crackle's farm buildings are plain, well designed structures of the business farmer, having both concrete floors and foundations. His concrete feeding floor is an extension of the concrete floor of the hog pens, and is 15 feet wide and the full length of the hog house. There are no rats because no open spaces are left between the ground and floor.

The concrete feeding floor may be likened to a series of sidewalks laid side by side. Such a floor should be 5 inches thick and should have a curbing on all four sides, extending about 18 inches below the surface of the ground to keep the hogs from rooting underneath, and its size will be governed by the number of hogs in the drove, allowing 18 square feet for each hog.

Concrete for feeding floors should be mixed in proportion of one sack of Portland cement, 2 cubic feet of clean, coarse sand graded in size up to ¼ inch, and 3 cubic feet of hard, durable gravel or broken stone varying in size from ¼ inch to 1 inch. All of the materials except the cement may usually be found close at hand. For each 100 square feet of feeding floor 2.7 barrels of Portland cement will be required.

The importance of thoroughly mixing the materials can not be too strongly emphasized. Whenever possible a batch mixer should be used. If no mixing machine is available, mixing may be satisfactorily done on a water-tight platform by using square pointed shovels. A bottomless box may be used for measuring the relative volumes of sand, cement and gravel or broken stone. After the required amount of sand has been placed on the mixing platform, the cement should be spread in a layer on the sand. Two men will then turn the sand and cement over two or more times until the streaks of brown and gray have merged into a uniform color throughout the mass. Coarse aggregate is then shoveled on and the mixing continued, water being added during the first turning after adding the coarse aggregate. Water should be added gently, preferably in a spray, in order to prevent washing out the cement. Turning should continue until the mortar is of uniform consistency throughout, which will usually require at least three turnings after adding water. Enough water should be added to form a "quaky" mixture, that is, the concrete should be wet enough so that when placed it will flatten of its own weight, but not so wet that the mortar will separate from the coarse aggregate.

Slab forms should be of 2-inch lumber, 6 inches wide. Thirty-six square feet should be adopted as the maximum area of a single slab, and 6 feet as the greatest dimension permissible. As the concrete is placed in the forms it should be lightly tamped by a wood-block rammer, then struck off level with a straight edge and finished with a wood float. In order to secure perfect joints, slabs should be laid alternately. In this way slabs are allowed to remain until the cement has partially hardened before the forms are removed and material for adjoining slabs placed.
As soon as the concrete has hardened sufficiently to prevent the surface from being pitted, it should be sprinkled with clean water and kept wet for at least four days. Concrete cures more uniformly when protected from sun, wind and rain during the curing period by a covering of straw or some other material that will retard evaporation. Feeding floors must not be used until thoroughly hardened, which will require from ten days to two weeks. Hogs should always be kept away from “green” concrete, since they consider it a delicacy and their fondness for freshly made concrete has caused considerable loss.

Only recently have farmers come to realize how serviceable concrete may be in the construction of feeding floors. With this realization the old mud hog lot is being relegated to the past, while concrete feeding floors are paying for themselves often within a single season, by the saving of grain formerly wasted in mud and filth.

Hog Wallows.

Long maligned as a lover of uncleanliness, the hog has been elevated to a position of positive self-respect by the introduction of concrete feeding floors and concrete hog wallows. He much prefers clean water in which to cool off during hot weather; his second choice is a mud hole. His thick coat of fat makes one or the other necessary. He has been imposed upon by the expression “as dirty as a pig,” but if given an opportunity, no other animal about the farm will be more cleanly than he. Unable to perspire, he naturally suffers during warm weather more than other animals; deprived of a cleaner place to cool his body, he will take to the mud.

Every hog raiser should consider the concrete hog wallow a necessity because of its merits in killing vermin when a quantity of crude oil or other insecticide is put on the water and the intake and outlet stopped. By this means the hog wallow accomplishes the purpose of a dipping vat. Many farmers keep a small amount of oil in the wallow at all times to keep the skin of the animals in good condition. As crude oil remains on the surface of the water, it is not easily lost through the outlet.

The wallow should be located near or connected with the farm water supply. If the water supply is limited the wallow may be emptied and filled at intervals, the intake and outlet ordinarily being closed. If the supply is unlimited water may be allowed to flow through the wallow continuously. Provision may be made for draining the outlet into the nearest line of tile. For the ordinary piggery the pool should be 15 to 20 feet long, 10 feet wide and 18 inches deep. A concrete apron 4 feet wide should be laid around it to prevent the hogs from burrowing or carrying in mud.

Chas. D. Ettinger of Tinley Park, Ill., has a concrete piggery opening out on separate hog lots, each of which is provided with a concrete hog wallow. This arrangement is ideal. The piggery is kept clean by the use of plenty of bedding and is frequently cleansed by flushing. Foundation walls are of concrete and the interior is floored with concrete.

Concrete feeding floors and concrete hog wallows are among the more important permanent improvements looking toward eradicating diseases that result from insanitary surroundings, and these improvements will naturally suggest to the progressive farmer many others beyond the scope of this article. Concrete hog houses constructed either
of monolithic concrete or of concrete blocks are extensively used, while interior fittings for hog houses are receiving scarcely less attention in the progressive campaign toward preventing disease by removing its cause. Old-style hog-raising is being superseded by scientific methods in sanitary surroundings, while the introduction of concrete in hog raising is probably doing more than any other agency toward the permanent eradication of hog cholera.

To say that concrete construction is permanent is no exaggeration. If properly constructed it will last forever, increasing in strength with age. Probably the greatest and most unfair argument used against concrete has resulted from failures on account of its misuse. Materials ranging between dirt and large boulders have been mixed with cement, which must result in very unsatisfactory work. Many times it is advisable to place such construction in the hands of a competent contractor or parties skilled in mixing and placing concrete, although very satisfactory work can be obtained with green labor under proper supervision. It is essential, too, that the owner should be familiar with the characteristics of good materials and workmanship. Success or failure may result from a careless selection of the former and improper manipulation of the latter.

There is considerable information available on the subject of concrete in its relation to farm improvements and every institute lecturer and farm advisor, as well as every farmer, should avail himself of it. Farmers' Bulletins Nos. 403, 361 and 481, by the United States Department of Agriculture, are devoted to concrete work, and almost all of our agricultural colleges, as well as the manufacturers of cement, have published reliable information on this subject.

When the farmers in general have become acquainted with the simple essentials for making good concrete, there is no doubt that this material will be used generally in every kind of structure on our farms. For work which does not involve complicated reinforcing problems, the farmer, with a knowledge of the essentials for making good concrete, is limited only by his ability to construct forms, and for this work a fair knowledge of carpentry is usually sufficient. A slovenly job of concreting is an abomination, but a careful piece of concrete work is a lasting satisfaction and a joy forever, something that your posterity can look upon with pride.

Dr. Luckey: Mr. Chairman, in regard to Mr. Warner's paper I thoroughly believe in the extensive use of cement in farm buildings and feeding spaces. I only want to call your attention to one danger, and I don't believe that we can afford to overlook it; that is the danger of this continuous feeding gutter which is used in many dairy barns for watering the cattle in the winter time. The first expensive sanitary barn that I know of in the State of Missouri was built under the advice of the most competent architect that could be secured, and was built largely of cement, and nothing was left undone to make it sanitary. I had this experience in that barn. In 1899 a herd of cattle in that barn were tested for tuberculosis and found sound. About a year later, in 1900, 94 head of cattle
were tested in that barn and 56 were condemned for tuberculosis. It was found that every cow was placed in the same stall at each successive milking, and that there was no shifting about of cattle to spread the disease. It was found that during the year a cow here and there in the barn would go dry and a new cow would be placed in her stall. During the year, some place about half way between the two tests, as well as I can ascertain, five cows from a neighborhood where I knew tuberculosis to be somewhat prevalent among cattle and hogs, were placed in this dairy in the first row. In stall number 5 one of these cows was placed. The feed was swept from stall number 1 down that row to stall 18, and out of the door. When the test was made six months afterward, the cow in stall number 5 reacted, and every cow to the end of the row reacted. Every cow from that stall to the end of the row in the direction in which the feed was swept, reacted to the tuberculin test.

Now how dangerous are these common feeding gutters? How can that danger be avoided? I submit that question to those who are studying the architecture of dairy barns. I believe personally that as long as these common feeding gutters are used, eradication of tuberculosis among dairy cows will be practically impossible. I would not want to discourage anyone in the building of sanitary barns and the use of concrete, but I would like to see that problem solved. I believe that between each feeding space a partition should be erected, not only sufficiently high to prevent the sweeping of feed down the gutter, or water going down the gutter, but so arranged that it would keep one cow from getting infection directly from a cow on either side. I believe that these feeding spaces should be arranged so that all feed that is left could be swept into the middle gutter out of reach of all the cattle, and then down the line out of the dairy barn.

The more you think about this proposition the more important you will find it to be. You take one of the ideal dairy barns of the present day, and it matters not how intelligent the owner of the herd may be, it is hardly possible but that he will at some time or other add a cow which will have advanced tuberculosis, and if he delays his regular test very long after such a cow is added, he is certain to lose more or less, and in some cases a large number of very valuable cattle. I simply want to get the idea before those who are engaged in sanitary work, that there is a great danger in the common feeding gutter where the feed and remnants of feed are swept from one row to another, because in that way you start infection, tuber-
culosis in particular, and probably other infectious diseases. I should like to see some architect with nerve enough and judgment enough and skill enough to devise a feeding space in the dairy barn that would obviate this one danger, and with nerve enough to advocate its use. I say that for the reason that two intelligent dairy men, having produced certified milk for a number of years, thoroughly familiar with the subject of tuberculosis, so much so that they became satisfied that they could buy cattle sound, tried in the last year to buy cattle in Ohio and New York, and took all precautions, and yet failed to avoid adding a tuberculous animal to the herd. We find that when one is once added, with this kind of feeding spaces, with the common feeding gutter, that the disease spreads rapidly in the herd, and it was only through good fortune in these cases that the test was made shortly afterwards, and they got away by losing three or four cattle apiece. If it had run on for six or eight months, or a year, the chances are they would have lost forty or fifty dairy cattle, some of which are registered and valued as high as a thousand dollars apiece. You can see what the danger is. I wish that we could get the people who are building sanitary dairy barns to consider this one proposition.

Dr. Kigin: When Dr. Luckey was talking I thought of the Nebraska State Insane Hospital. Five years ago there was a test made there of 140 head of cattle, and 85 of them reacted. Four years ago out of 132 head tested, 56 reacted. Two years ago there were 47 head that reacted out of 119 head. Last year there were 27 that reacted out of 101 head, and there were 7 suspicious cases. While Dr. Luckey was speaking about this matter of sweeping the food all one way, I thought of the conditions prevailing there, that is, what was done at that institution. The barn was only built seven years ago. The floor of the loft was very low, and there was no light. They had 140 cows in a space where they ought to have had about 75, and all of the food was swept down to one center aisleway. When he spoke of that it brought the matter to my mind, and I thought at the time when I examined that state barn two years ago, that possibly a great deal of the trouble was coming from that one thing. Two years ago they started to reconstruct, and they finished last year a new barn, and they had an architect come out there to make a study as to how to prevent tuberculosis on that particular farm. I believe there are eight or ten feet of space between the cows' heads in this barn. There is a galvanized iron partition between each of those cows, dropping into a grove that has been made in
the cement, and each one of these troughs is swept out, into the center, so that there is no sweeping from one animal to another. Now this barn has not been constructed long enough to know just exactly what the results are going to be, but the Board of Control of that institution is figuring on putting in individual drinking troughs for each one of those cows. They have been buying so many cattle to replace those which reacted to the tuberculin test that they are getting tired of it. Every year from 40 to 80 head of cows have been reacting, and they are trying to see if something cannot be done; therefore they are thinking of putting in individual drinking troughs.

At the Norfolk institution three years ago there were something like 34 head of cows reacted. At that time they started the construction of a new barn which they completed this year; built an outside shed that faces south, boarded at each end, and very high in the front and tapering very much toward the back. They had 72 cows last year that were tested, and one was found that was suspicious. They took that one cow out, and this year we made the test and found one suspicious, and we also took that one out. We took no chances. At that institution they absolutely cleaned the yard, they cleaned the watering trough every day, and about once or twice a week they would go over this watering trough with a disinfectant, and then they also threw some lime into the water. Those cows have only been in the barn three nights in the past two years. They have turned them out every day, and then at night they return to this open shed. So that of course goes to prove that turning the cattle out, and having an outside shed of that kind, is certainly very beneficial, and has been one great measure in preventing the disease.

At the State Penitentiary they built the same kind of a shed two years ago. I believe last year there were 45 head of cows there, and this year 38, and there I only found one cow to react. They have gotten this excellent condition there by simply resorting to the same thing that I previously mentioned.

At the Lincoln Insane Asylum they have 74 head, if I remember rightly. Last year they had 15 that reacted. They did not have this shed built on the outside, but along in the winter they built it, and began to turn the cows out, and in the test this spring there were seven that reacted. They did not turn them out as much as they did at the other institution, but they are very unfortunate there in having a cow barn in the basement of the horse barn, where it is very dark. I do
not understand why the state ever put up such a barn. It is so dark that you have to use a searchlight in the day time to see your way through it. They are asking the legislature, however, to appropriate a sufficient fund to construct a barn there equally as good as the one that has been built at the Hastings institution which I have previously mentioned.

As I have been taking a very active part in trying to eradicate the disease from this state institution, I took motion pictures of conditions there from every phase, not only showing how these barns are constructed, but the manner of preventing the disease. I have also taken pictures of many other places throughout the state, following the progress of cattle through to the killing floor, and I hope that I will have an opportunity of showing that picture in a good many places, because I believe that showing 2,000 feet of picture will do more good than it is possible to do by simply telling the people of conditions, and what to do. I have shown this picture around, and I believe it has meant more toward the eradication of tuberculosis than quarantining or killing could do. I don’t say that I have done more good or that it has been more effective in really eradicating the disease, but I do say that a great deal of intelligent interest is stirred up by going into a town and giving a lecture on this subject and showing these pictures of the diseased areas and showing conditions and giving statistics. In a week’s time there will be from five to ten or fifteen letters coming in from that district saying: “I want my cattle tested.” There is no controversy on their part as to what shall be done to the reactors, on the other hand they willingly ship them in to be destroyed.

Now there is another thing I want to mention. In our state there are four brothers, whose father died a couple of years ago. He had spent his life in growing and bringing up a very fine Durham herd, and I believe that his is the finest bunch of cattle that we have in the state. At the time this man bought his farm there was a barn on it that had been built by a man that dealt very extensively in sheep, and he had constructed it for a sheep barn. The roof ran down on one side, so I think there was only about five feet of weather board. There were no windows in the barn. There was not a dog-house on top of it. There was no way of getting air into it. This man was very much against the tuberculin test. He did not believe in it. In fact he fought the tuberculin test, condemned it and wrote articles against it. But after the father died, two years ago, the estate was to be divided, and the sons wanted to have their sale of cattle in South Omaha,
and they had to have the test, of course, before they could have the sale. I found 18 reactors out on this farm, which represented a value in the neighborhood of $7,000. They fought the test until I went out there one day with them and tried to educate them as to the value of the test, as to what it would mean to them. I suggested to these people that they should reconstruct the barn. They said they were not able to rebuild the barn. I suggested that they place windows on the south side so as to make light, and swing the cow's heads towards these windows and have constant light, and then also put a box on the outside and a box on the inside, with the top out, so it would bring in air, and that they also put two-foot lights every ten feet on the slant of this roof. They adopted my suggestion and cleaned this barn out and absolutely reconstructed it the way I had told them to do. I think it would be a very good thing to have photographs taken of a reconstructed barn of that kind, because I believe today those people have a barn that is sanitary and a barn that has sufficient sunlight, that has sufficient air, and is just as good, really, as the barn that I previously mentioned, at our state institution. There are so many people who, after they have had to make a sacrifice of ten, fifteen or twenty cows, cannot afford to build a barn, but a little reconstruction will help a great deal, and ward off the fifteen or twenty reactors for the next year, when we make another test. So if I remain in the department, I intend to photograph many barns like that before they were touched and after the reconstruction, which will be more of an incentive and an inducement to the people over the state to make such modifications of the barns that they already have.

Dr. A. E. Campbell: Mr. Chairman, I would like to say a few words on this subject. A few years ago Dr. Chapin of Providence, wrote a book on "Sources and Modes of Disinfection," and in that book he said it was not so much a question of disinfecting the man as the things he came in contact with, the things that came from him or the things that he touched. Immediately all over this country we began to recognize that, and take action accordingly.

Now, if I was treating a case of itch, I would not only go after the person that had the itch, but I would take care to clean his clothing, clean the night gown he wore, and change the sheets in his bed. If I was treating a case of typhoid fever I would disinfect the excretions before they left the bedroom. If I was treating a case of tuberculosis I would disinfect the excretions, the sputum, before it left the bedroom. And in treating a cow that was infected, you should disinfect not only
the cow, but disinfect the place in which the cow lives, the stock pen. The same way with the common troughs, those drinking troughs should be disinfected with the strongest solution of bichloride of mercury, about 1 to 500.

Now one word about crude oil. Crude oil has another effect in regard to the well being of the hog. The mosquito or the fly cannot bear crude oil; they will not go near it. And so the hog would not be disturbed by flies or mosquitoes.

One word about concrete. I am connected with the Illinois Central Railroad and I am trying to get them away from board walks and board floors in their depots and their freight houses. The rat is very destructive, especially to freight. Not long ago I went into a place where rats had eaten up a whole ham in one night. If you used concrete in your stables you would keep rats and mice out. For instance, you cannot get a housewife today that will buy a wooden bed; she will buy an iron bed. Why? Because you cannot keep bedbugs out of the wooden bed; you cannot keep bugs or anything else out of stables unless you have concrete, so that those vermin that affect cattle will not have a lodging place. If you use concrete you drive the rat out of existence, you keep him from his provender and feed, and if he can not get into your barns he is not likely to disturb your animals in any way.

THE RECOGNITION OF ATYPICAL FORMS OF BLACKLEG IN THE UNITED STATES.

K. F. Meyer, Berkeley, Cal.

A. Blackleg in Cattle.

In June, 1913, the laboratory of the Pennsylvania State Live Stock Sanitary Board received portions of the internal organs of a 9-months-old heifer, from a region where blackleg or anthrax had not been recorded. The clinical history and the autopsy report read as follows:

History.—On Monday evening the animal refused to eat and showed indications of colicky pains. Dr. G. called and attended her, and later she quieted and ate as if feeling better. Temperatures taken at different times showed no rise. Died during Wednesday night. Diagnosis: "Poisoning"?

Autopsy Report.—Guernsey heifer, 9 months old; post-mortem about twelve hours after death. General condition, good. Skin, soft and pliable. Visible mucous membranes, slightly anemic. Upon removing the front leg the blood was noticed to be dark, thick, and non-coagulated. Subcutaneous tissues, normal. Mesenteric arteries, deeply injected. Intestinal tract, apparently normal. Spleen was small and the pulp was pale; margins flat. Lungs showed pneumatic areas (?). Bile duct, distended and well filled. Gall bladder contained large amounts of rather thick bile. Liver showed numerous discolored (copper colored) areas, and one small yellow area which was on section "tendinous."
Pericardium greatly thickened, fatty, and in the pericardial sac, several "calcareous" bodies. Heart showed degeneration. (Report by Dr. S.)

A personal examination of the tissues sent revealed the following alterations:

"All the organs have a peculiar acid, rancid odor. The piece of liver is light brownish, dry but soft; under the capsule and scattered through the parenchyma are yellow-grayish areas of a dry, porous, spongy consistency; the size varies from 2 to 5 cm. diameter. Some are ochraceous in color. All the fine spaces of the tissue in these areas contain gas of a butyric acid odor. The spleen is slightly swollen; the capsule is steel blue; the pulp, dark brown reddish and jam-like on section. The pericardium is covered with fibrinous filaments of a net-like structure. The blood is firmly coagulated in the ventricles. One piece of the lung is very rich in blood and shows indications of hypostatic congestion.

"The microscopical examination of the liver foci showed: Slightly motile, gram-positive, irregularly shaped rods. The spore-bearing forms are of the closteridium type; the spores are small and oval and in cells, which are rich in granules. The spleen contains a very large number of clostridium forms together with long, thick rods. The pericardial exudate shows only a very few rods, which stain poorly.

"Based on these findings, the tentative diagnosis of malignant edema, or blackleg, was made. The detailed bacteriological examination proved the diagnosis, "blackleg," to be correct.

"From the liver areas in glucose broth and agar with sterile liver pieces, brain media and blood broth, typical B. chauvei were isolated. The organisms coagulated sterile whole milk in four days, did not peptonize the curd, fermented glucose, saccharose and lactose; did not blacken the brain medium and were agglutinated by a serum prepared with a stock blackleg-strain (titer—1:10000) in a dilution of 1:8000; a Ghon-Sachs bacillus serum did not agglutinate the organism. Guinea pigs (4533) inoculated subcutaneously and intramuscularly died in from 24 to 36 hours p. operationem and showed a marked hemorrhagic edema, with numerous rods, which were single or in pairs on the liver surface and in the fluid of the abdominal cavity; from the heart blood the same organism as mentioned above was isolated. Two rabbits (4529 and 4530) and one pigeon (4531) injected with an emulsion of the liver foci, remained alive, and developed only slight reactions at the seat of inoculation."

This report represents only an example of several identical or similar cases which have come to my notice in the course of the last two years. The case just reported was doubtless responsible for the interest I took in similar cases in cattle in which the clinical diagnosis was not confirmed by the autopsy. Furthermore, the prolonged and extensive practice of working with anaerobes perhaps accounts for the fact that these cases have been successfully studied.

When looking over the reports one notices that the autopsies (which were done carefully) failed to indicate any skin or muscle changes; the alterations in the liver were conspicuous, however, and I remember having called the attention of my assistants to these lesions. From previous experience I involuntarily associated these changes with an infection by anaerobes. Primarily, I did not connect the process with blackleg, because I always had seen—and had read in the text books—that muscle lesions are absolutely necessary. In recent years, however, I had seen feeding infections with the B. chauvei, and there had frequently noticed muscular changes in the diaphragm only. I therefore
reviewed the literature again and found that Warringholz had described liver lesions—of the type seen by my assistants and myself—as typical for blackleg; later, Wulff recorded the liver changes in twenty-six out of thirty-one cases. The latter also pointed out that in a certain number of cases (12 to 15 per cent) of blackleg, the changes in the muscles were absent and that the disease was only recognized by the liver or the pleura and pericardium lesions (sero-fibrinous exudate) followed by a careful bacteriological examination. In a small percentage (22 per cent) of cases the muscle lesions were confined to the tongue, masseter or the myocardium (see Kiesel). Similar observations were also made by Foth, Kitz, Tillmann, and others, during their studies on the diagnosis of blackleg. They all agree that the disease is not so readily recognized as it appears from the text books, and the general opinion of the sanitarians is that the diagnostic methods are time absorbing, tedious, and call for considerable laboratory experience.

1. Berliner tierarztl Wochenschrift, 1908, p. 66.
5. Handbuch d. pathogenen Mikroorganismen, 2d Ed., 1912, vol. 4, p. 320

After having obtained this information, it became apparent to me that probably the above-mentioned observations did not involve anything new, but suggested that a large percentage of deaths of cattle remained a mystery on account of our lack of appreciation of the facts published by Warringholz, Wulff and others. That this reasoning was correct was proven through the recurrence of similar cases in quite different sections of the country. One instance is here reported in detail:

Material sent to the laboratory of the Board of Health of California was suspected to be anthrax. The suspicion that the case was blackleg (which is so common in the region where the animal died) was, at autopsy, not confirmed, the usual muscle lesions being absent, as the report emphasized. No anthrax bacilli could be demonstrated bacteriologically nor serologically. The organs sent for examination were shown to me. On section of a piece of liver I noticed several small, yellowish, spongy foci which contained numerous irregular, closteridiurn-shaped rods. My tentative diagnosis of atypical blackleg was confirmed through the bacteriological tests.

No doubt exists in my mind that numerous cases of blackleg in this country have not been correctly recognized, or have been diagnosed as "poisoning," or otherwise. I feel it my duty to call your attention to these conditions and to encourage here the study of animal diseases caused by anaerobes. To assist you in this task I will briefly discuss the methods employed and will give also, where possible, an interpretation of the possible findings. For further details I refer you to some of my publications on this subject which will appear at an early date.

The methods of investigation used by my assistants and myself are as follows:

I. Autopsy.—Note particularly the degree of decomposition; the peculiar butyric acid odor; the changes in the liver and pleural cavity. Never fail to incise all the muscles (tongue, masseters, diaphragm, etc.). The inflammatory changes in the intestinal tract are of minor character
in blackleg. There is only a slight catarrhal or hemorrhagic duodenitis. The mesentery is always deeply injected.

II. Microscopic Examination.—For a bacterioscopic examination, select either muscle lesions, liver foci, or smears from the diseased serous membranes (pleura, peritoneum, etc.). Stain with thionin, Gram and also with Lugol's solution (demonstration of granulose). The B. chauvei has no characteristic morphology; the closteridium forms are also characteristic for some bacilli of the gas phlegmon group. Other cadaver, and soil bacteria, in particular, are morphologically nearly identical with the blackleg organisms. The beginner is warned to diagnose blackleg from the microscopic findings only.

III. Animal Inoculations.—Small pieces of the diseased tissues are either ground with saline and immediately inoculated in guinea pigs, or, inasmuch as the material is usually contaminated with other organisms (frequently symbiosis with capsulated diplococci of the pneumococcus type), small pieces are dried at 37 degrees C. (such material is kept in sealed tubes for further study), then powdered, suspended in saline and heated for 30 minutes at 56 to 60 degrees C. This treated material is injected subcutaneously on the backs of two guinea pigs. In case the material contains B. chauvei, the autopsy findings are typical. In 16 to 36 hours the animal succumbs to the infection; there is a sanguinolent, hemorrhagic, subcutaneous edema, with slight or pronounced affections of the muscles. In the abdominal cavity there is only a small amount of exudate; there is no enteritis (there is always duodenitis and jejunitis in infections with the organisms of the malignant edema group). The microscopic examination is very typical. On smears from the liver surface pairs only—and never aggregations of filaments of bacilli—are seen; they stain deeply; also in the heart blood, spleen, etc., similar rods are easily found. In the diseased muscles and edema most of the bacilli are plump, somewhat distorted, and contain granulose and some spores. The absence of filaments is seen only when the autopsy is performed a few hours after death. In cadavers 18 to 24 hours old one finds frequently indications of filaments, but never as frequent as in representatives of the malignant edema group.

IV. Cultural Studies.—In every instance cultures should be made from the inoculated guinea pigs. In most cases the heart blood is satisfactory. The B. chauvei does not grow very readily in the ordinary media, even when kept strictly anaerobically. We have used, with success, the so-called Burri tubes in which a small piece of sterile tissue (best beef muscle or guinea pig liver) is placed at the bottom. Rabbit organs give poor results. The organs are stratified with a ½ per cent glucose agar (plus 0.5) carefully boiled and cooled to 45 degrees C. By means of a pipette the heart blood is inoculated, the necessary dilutions are made in three other tubes similarly prepared as tube No. 1; after shaking, they are cooled immediately in ice water. The preparation of plates is not very satisfactory; in our hands, deep tubes gave better results than plating methods, by keeping the same in a hydrogen atmosphere or in a vacuum. It is not permissible to inoculate liquid media with heart blood and consider the anaerobic growth obtained in such a medium to be a pure culture of the B. chauvei. In two instances in which I had practiced this method I found later a mixed culture of B. chauvei and a representative of the malignant edema group. Pure cultures are absolutely necessary for all further tests. The growth in the depth of the agar is typical, the colonies are very small, roundish
or oval, with entirely or slightly lobulated edges. The \textit{B. chauvei} never forms fluffy, cotton-like colonies. An isolated colony is transferred to blood broth (½ glucose plus 4 drops of horse, sheep or rabbit blood) and brain medium.

In the first medium the \textit{B. chauvei} produces a large amount of gas, so that the medium froths like charged water. The brain medium is never blackened, and permits—in case the culture is contaminated with anaerobes—a separation by heating the medium. In brain media the blackleg organisms preserve their virulence very satisfactorily, also the spore formation is very good, so that tests for the spore resistance can readily be carried out. From the brain media, milk and coagulated serum and egg albumen can be inoculated; also the fermentative activities on various carbohydrates can be tested. All these tests can, however, be omitted, as they are not necessary for a conclusive diagnosis.

For detailed information on this subject I refer you to the publications of v. Hibler\textsuperscript{1} and Foth\textsuperscript{2}.

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\textsuperscript{1} Untersuchungen über die pathogenen Anaeroben, etc., Jena, 1908.

The pure blood broth culture is injected in rabbits, pigeons and rats. These animals are ordinarily immune to the \textit{B. chauvei}. In our tests only one rabbit succumbed to an intravenous inoculation. In several instances the rabbits lost considerably in weight and developed abscesses.

V. Serologic Test.—The quickest and most satisfactory diagnosis was obtained by using the ordinary agglutination test. Rabbits produce very potent sera when inoculated slowly with heated cultures. Such sera are exceedingly specific and agglutinate the blackleg bacillus only. In rare instances only, they give coagglutination in low dilutions with other anaerobes. We use 24-hour-old broth cultures and rabbit antisera, which we always keep on hand in sufficient quantities. The precipitin test is not as reliable as the agglutination tests.

A few experiments with the thermo-precipitin test, according to Hecht\textsuperscript{1}, Miessner and Lange\textsuperscript{2} failed to confirm, in two out of six instances, the diagnosis which had previously been made. The passive immunization of guinea pigs according to Kitt\textsuperscript{3}, and the subsequent test inoculation with the isolated organism, has not been used by us.

All these tests can be carried out easily in any laboratory. It is to be hoped that some Government laboratory will prepare the necessary diagnostic agglutinating sera, and then the diagnosis of blackleg is exceedingly simple. The same methods should also be employed when investigating the etiology of other diseases of animals. One example I will briefly mention:

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\textsuperscript{1} Centralbl. f. Bakteriol. Abt. 1; vol. 67. 1912. pp. 371-381.

\textbf{B. Blackleg in Hogs.}

The application of these methods has enabled me to explain the etiology of a hog disease which has for many years been misunderstood.

Most comparative pathologists agree that blackleg can not be produced artificially in hogs. However, numerous cases have been recorded by Marek, Born, Battestini, Koves, and others, in which lesions were seen in the muscles of pigs which were anatomically identical with blackleg in cattle, and the disease was designated as blackleg of hogs.
In 1913 I studied three specimens which were collected in Pennsylvania by my assistant, Dr. Deubler, and myself at autopsy from large hogs. The anatomical lesions in the muscles of the neck directly behind the tonsils so strongly resembled blackleg, and the microscopic findings were so similar to the B. chauvei, that at first the diagnosis of blackleg in hogs was made. A careful study of the organisms revealed the fact, however, that a well-known representative of the malignant edema group, namely, the Ghon-Sachs bacillus, was responsible for the lesions.

I will elsewhere enter into the discussion of the bacteriological study of this disease and its cause. Shortly after our studies had been completed, Koves reported some work which confirmed our observations. It is therefore proved that the blackleg-like affections in hogs are clinically and pathologically an entity, are apt to occur in this country, and are caused by the Ghon-Sachs bacillus. This observation shows, furthermore, that the Ghon-Sachs bacillus exists in North America and can therefore also be expected in other diseases (malignant edema in horses, sheep, etc.). The bacillus is also pathogenic for man. Dinwiddie, in his recent studies on hog cholera, describes anatomical lesions and an anaerobic organism, the first being similar to those noted by Koves, the latter probably identical with the strains isolated by myself.

Recent studies of a disease of cattle in the Sierra Mountain ranches (which is still in progress) offered further opportunities for the study of blackleg-like affections. The methods cited in this review have proven exceedingly valuable and can, therefore, be fully recommended.

Conclusions.—1. Attention is called in this note to the occurrence in this country of “atypical” blackleg. The term is used to specify that blackleg can occur in cattle without showing the lesions published in text books and commonly emphasized to students and the laity. The pathologic-anatomical lesions (particularly in the internal organs, as liver and pleura) are far more multiform than suspected. It is essential that complete autopsies be made on all cattle; also, sporadic cases often offer valuable information and enable the sanitary officer to prevent further losses. The methods of diagnosis are cited and explained.

2. The occurrence of blackleg-like affections in hogs in this country (in Pennsylvania) is reported. As a causative agent, the so-called Ghon-Sachs bacillus has been found. These results are confirmed by the work of Koves in Hungary.

Dr. Haslam: At the Kansas Station, Dr. Franklin and myself, particularly Dr. Franklin, have done considerable work on “blackleg,” and as Dr. Franklin is not here I will report the work.

One such case as just reported in the hog has been encountered, and the same conclusion reached, though we did not attempt to name the organism. The case was in a valuable hog which had been shipped to the college, where it died. Post-mortem showed along the neck black meat, the odor identical with that which we commonly associate with blackleg. We have had at various times, a good many pseudo-blackleg cases. In the case of this hog one would have been
absolutely positive from the odor that it was blackleg. We use a little different culture medium, and perhaps it is prepared a little more simply than that recommended by Dr. Meyer. Make up a bouillon, starting with liver instead of the ordinary meat, and then add agar which gives you a fairly transparent culture medium. I find that the blackleg has a fairly typical colony, not, to be sure, an absolutely typical colony, but when the size and the appearance of the colony under the hand lens is seen you can get considerable information. Isolate into tubes of brain medium, made by taking fresh brains from the slaughter house, which are ground up and mixed with the liver bouillon, which gives a medium on which you can cultivate the bacillus. It grows, and shows a characteristic growth when you are familiar with the organism. In this particular case, the cultures were made; and they showed a slight difference morphologically. Almost anything looks like blackleg when you compare it with the pictures in the text books. However, Dr. Franklin is able to tell a great deal from their morphology. To those who are working every day with blackleg the details of morphology, staining, etc., mean a good deal, but to those who are not working constantly with blackleg they do not mean anything. This organism from the hog has a morphology slightly different from that of the blackleg bacillus.

We have a blackleg anti-serum that is prepared from pure cultures: It was checked up with Foth culture from Germany. We found that Foth’s anti-serum would protect against these American strains. Then we made up blackleg anti-serum from our own strains which would protect against Foth’s strain, and it also protected against the strains that were isolated from the Lyonnaise vaccines and the Bernese vaccines. So we find no international difference between the blackleg strains. That increases our confidence in the test that we commonly apply.

We take four guinea pigs and give two of them a test of the culture under consideration; two are not given it. If the two that are given the serum survive we feel pretty confident that we have the diagnosis of blackleg. In the case of the hog referred to the serum had no protective action against the pseudo-blackleg. We have encountered other strains that we have worked through in the same way. Those strains are sometimes more pathogenic than the strains I have spoken of. One strain came through a contamination, and the contamination resulted in the death of a mule that was given a sub-
cutaneous injection. Another strain is of quite wide importance inasmuch as it frequently exists in a contamination in biological products. I think the question of the diagnosis of blackleg and the question of the pseudo-blackleg, increase in importance as we know more about them.

The cases reported in which it is impossible for the ordinary veterinarian to diagnosis the blackleg are very interesting. We have had a few cases of cattle where we had the minor lesions, but we have not had an opportunity to investigate the cases of the obscure difficulty. In most cases where the farmer thinks he has blackleg he does have blackleg, judging from the samples that are sent in to us.
Mr. President and Members of the Association: At the last meeting of this Association I had the privilege of describing to you the work begun by the Bureau of Animal Industry in the year 1913, on problems relating to the control of hog cholera. At that time we had instituted field experiments in three counties and had made a bare beginning in the work of enforcing the law governing the interstate shipment, importation, sale, etc., of viruses, serums, toxins and analogous products. During the year 1914 the work of the Bureau has been so broadened and the investigations undertaken have been so extensive and varied, that it is not possible, even if it were desirable, to undertake a detailed discussion at this time of all phases of the work. It shall be my endeavor, therefore, to present merely the results which have been obtained, with some discussion of the significance of these data in relation to the control of hog cholera.

It seems desirable first of all to sketch very briefly the general plan and scope of the work which the Bureau of Animal Industry is now carrying on. The hog cholera work of the Bureau of Animal Industry is supported by an appropriation made by Congress and approved by the President on February 23, 1914. This appropriation amounts to $500,000, of which about $360,000 will be spent before the first of July, 1915. The work is divided into three major projects, or classes, as follows:

Project A.—A definite area (one county) has been selected in each of fifteen states. Observations relative to the control or eradication of hog cholera are being made in each of these areas. The Department of Agriculture places generally three qualified veterinary inspectors in each area and furnishes the serum required for its work. The states are expected to co-operate by carrying on the needed educational work and survey of the county, and by enforcing the necessary quarantine and sanitary regulations. A more detailed discussion of Project A will be taken up later.

Project B.—This project consists in the supervision of all establishments which conduct an interstate business in hog cholera serum and virus, and the work is intended to protect veterinarians and farmers against the use of worthless or dangerous serums and viruses. The work under this project is carried out entirely by the Department of Agriculture and consists in the inspection of serum and virus plants, the issuance of licenses to qualified establishments, the supervision of serum production in licensed establishments, the examination and testing of samples of serum and virus, and the collection of evidence bearing upon violations of the law under which this project is established.
Project C.—This consists of demonstrational and educational work among farmers, in co-operation with the state colleges. The idea pursued in this work is to organize clubs for educational, demonstrational, and other work in the prevention of hog cholera; and to work with county advisors and farm demonstrators to promote educational and propaganda work concerning methods of preventing hog cholera through sanitary and quarantine measures and the use of serum. The fundamental idea of this last project is to demonstrate to farmers how they may, by their own efforts, reduce losses from hog cholera.

The work of the Bureau of Animal Industry may thus be said to consist

First, of educational work as a basis for its other activities.

Second, of control work to prevent the interstate shipment of contaminated serums and viruses.

Third, of experimental work in selected areas to determine the most effective and practicable means for reducing losses from hog cholera, and of finally eradicating this disease, if possible; and

Lastly, of laboratory researches on subjects concerning the etiology and prevention of hog cholera.

Results from Project B.

Turning now to the results secured from this work, I wish to speak first of Project B, the inspection and supervision of establishments manufacturing and shipping hog cholera serum interstate.

At the beginning of the year 1914 we had only a nucleus of an inspecting force. During the year we have selected and trained for this work thirty-four veterinary inspectors. We hope to materially increase this number in the near future. The following data give some idea of the work during the year 1914:

- Licenses issued to hog cholera serum companies: 81
- Licenses refused: 43
- Licenses suspended: 1
- Licenses revoked: 5
- Violations referred to Department of Justice or now under investigation: 20
- Number of cities in which licensed plants located: 29
- Amount of serum manufactured at licensed establishments (1914): 140,000,000 c.c.
- Amount of worthless or contaminated serum withheld from sale by Bureau of Animal Industry: 2,812,000 c.c.
- Commercial value of this serum at $0.02 per c.c.: $56,000
- Money expended by licensed plants to meet requirements of Bureau of Animal Industry: $370,576
- Money expended by Department for inspection (approximately): $42,000

The circumstances surrounding the contamination of one lot of hog cholera virus with foot-and-mouth disease, have already been explained by Dr. Melvin and Dr. Mohler. I wish to add to this a very brief statement of the steps taken to prevent a recurrence of trouble from that source.

First, in the case of licensed plants located in areas quarantined against foot-and-mouth disease:

No new stock admitted to premises during quarantine; yards, pens, buildings, etc., disinfected; neither serum nor virus permitted to be shipped until Federal quarantine is lifted.
Second, licensed plants located in free areas, not quarantined:

New stock admitted only when originating outside of quarantined areas and accompanied by certificate that farm of origin is free of foot-and-mouth disease; all incoming stock inspected; premises disinfected as a precautionary measure and quarantine of premises maintained by owner; all serum is tested on pigs which are inspected for foot-and-mouth disease; all virus for simultaneous inoculations must have added to it 1 per cent carbolic acid by volume, and must be held at the plant until it has been found free of foot-and-mouth infection by a test on calves.

Results from Project A.

I wish now to ask your attention to some of the results of the work known as Project A, the county experimental work.

As I have already stated, this county work was begun in the mid-summer of 1913, in three counties, namely, Dallas County, Iowa; Pettis County, Missouri, and Montgomery County, Indiana. During the past year (1914) this work has been largely extended until we now have experiments under way in sixteen counties in fourteen different states. The methods employed in these counties have been purposely varied and of course the problems which we have had to meet have been found to be different in different localities. In some counties all of the inoculation work has been done with the serum alone. In other counties the simultaneous method has been used in conjunction with the serum alone. In these latter counties in an infected herd the apparently infected hogs were given the serum alone, whereas the hogs which appeared well at the time of treatment were given the simultaneous inoculation. The organization in each county has consisted usually of one veterinary inspector in charge, with two veterinary inspectors as assistants, and one clerk to maintain records. These men have had the cooperation to a greater or less extent of state authorities. The state college in many cases has undertaken to make a survey of the area, collect statistics, and assist in general educational work in the county. The state veterinarian, or state live stock sanitary board, has undertaken the duty of enforcing the necessary quarantine and sanitary measures, and supervising the disinfection of infected premises.

I wish to particularly impress upon your minds that these county experiments are not intended primarily to demonstrate how to eradicate or control hog cholera, but they are rather a series of experiments, on a large scale, by which we hope to ascertain the best and most practicable methods for the control of hog cholera. We feel that the question of controlling hog cholera is of such vast importance, and that it is, in the United States, a problem of such immense difficulty, that careful preliminary work on a large scale should be carried out before a nationwide campaign of any kind is attempted.

The inspectors in charge in each of the sixteen counties in which we have carried on active work during the year 1914, have collected and furnished data upon a variety of subjects. The figures thus supplied by the field men have been grouped and combined and the results are presented in some of the tables which I shall now show to you.

I wish to discuss first the effectiveness of the serum treatment. Table I shows the results following the treatment of herds which were apparently well when treated but which were regarded by the field inspectors as exposed. They are usually hogs on farms in the immediate vicinity of an infected herd. It will be seen that in the exposed herds
the losses following the serum alone and simultaneous methods are insignificant in both cases. The slight difference which appears in favor of the simultaneous method is too small to be regarded as indicating the superiority of the one method or the other. I believe, however, in view of the fact that only fourteen out of 8,000 hogs died following the simultaneous inoculation, that we may fairly draw the conclusion that it is entirely possible to apply the simultaneous method with safety.

Table I.

RESULTS IN EXPOSED HERDS, 1913-1914.

*Appropriately well when treated.*

<table>
<thead>
<tr>
<th>Mode of Treatment</th>
<th>Number Treated</th>
<th>Number Lost</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum alone</td>
<td>9,686</td>
<td>34</td>
<td>0.3</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>8,010</td>
<td>14</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>17,696</td>
<td>48</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table II shows the results in herds which were affected with hog cholera at the time of treatment. As you will see, out of 53,485 sick hogs treated, 29.1 per cent died. Of the well hogs in these infected herds, approximately 44,277 were given the simultaneous inoculation, with a loss of 2.9 per cent, whereas 40,462 were given serum alone treatment with a loss of 5.1 per cent, the total loss among well hogs in infected herds being 3.9 per cent, and the grand total of losses, counting all hogs both sick and well that were treated, was 13.7 per cent, the total number treated in these sick herds being 138,224.

Table II.

RESULTS OF TREATMENT OF HERDS AFFECTED WITH HOG CHOLERA, 1913-1914.

<table>
<thead>
<tr>
<th>Hogs sick when treated—serum alone</th>
<th>Number Treated</th>
<th>Number Died</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53,485</td>
<td>15,570</td>
<td>29.1</td>
</tr>
</tbody>
</table>

Hogs apparently well when treated—

<table>
<thead>
<tr>
<th>simultaneous</th>
<th>Number Treated</th>
<th>Number Died</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>44,277</td>
<td>1,298</td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>serum alone</th>
<th>Number Treated</th>
<th>Number Died</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>40,462</td>
<td>2,077</td>
<td>5.1</td>
<td></td>
</tr>
</tbody>
</table>

| Total         | 84,739        | 3,375       | 3.9      |

| Total         | 138,224       | 18,945      | 13.7     |

In passing, it may be well to call attention to the fact that of the 138,224 hogs treated in sick herds, approximately 38 per cent were sick when treated, the sickness being indicated either by the physical appearance of the hog or its temperature. Although 38 per cent were sick, only 13.7 per cent died. This indicates clearly that the serum has a distinct curative action when administered in the early stages of the disease.

In Table III there are presented observations of the effect of inoculation upon pregnant sows. You will note that the percentage figures show that in sick herds 12.8 per cent of the sows treated by the serum alone method aborted, whereas 9.5 per cent of those treated by the simultaneous method aborted. I have not the data to show what per-
percentage of those which received serum alone were well at the time of treatment. It is fair to assume, however, that the higher percentage of abortions among sows treated with serum alone is attributable to the fact that some of these sows were affected with hog cholera when treated, whereas although some of those given the simultaneous method may also have been infected, it is probable that the number of infected sows given the simultaneous treatment was less than in the case of the serum alone. I consider that these figures indicate that the simultaneous method does not produce abortion in pregnant sows.

Table III:

<table>
<thead>
<tr>
<th>Mode of Treatment</th>
<th>Number Sows</th>
<th>Number Aborted</th>
<th>Per Cent Aborted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infected herds</td>
<td>Serum alone</td>
<td>981</td>
<td>126</td>
</tr>
<tr>
<td>Infected herds</td>
<td>Simultaneous</td>
<td>388</td>
<td>37</td>
</tr>
<tr>
<td>Exposed herds</td>
<td>Serum alone</td>
<td>96</td>
<td>2</td>
</tr>
<tr>
<td>Exposed herds</td>
<td>Simultaneous</td>
<td>28</td>
<td>0</td>
</tr>
</tbody>
</table>

Last year the question was raised as to the effect of the simultaneous treatment upon the fertility of sows. We had no information at that time, but during the past year Dr. Koen, who is in charge of the county experiments in Dallas County, Iowa, collected for me the statistics given in Table IV. As the table shows, the observations included 1,746 sows that were treated by the simultaneous method, in 126 different herds. Of these, 5.62 per cent appeared to be sterile. There were 1,103 sows on 87 different farms which were not treated in any way and of these 6.7 per cent appeared to be sterile. The observations here recorded are extensive and I think the conclusion may be fairly drawn that the simultaneous method, when properly applied, does not produce sterility in sows. The very fact that hyperimmunes (sows which have received enormous doses of hog cholera virus) frequently, and in fact generally, bring forth normal litters of pigs, confirms this view.

Table IV.

EFFECT OF SIMULTANEOUS TREATMENT ON FERTILITY.

Dallas County, Iowa, 1913-1914.

<table>
<thead>
<tr>
<th>Number Herds</th>
<th>Number Sows Treated</th>
<th>Number Sows Sterile</th>
<th>Per Cent Sterile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated</td>
<td>128</td>
<td>1,746</td>
<td>98</td>
</tr>
<tr>
<td>Untreated</td>
<td>87</td>
<td>1,103</td>
<td>74</td>
</tr>
</tbody>
</table>

The figures which I have presented in the preceding four tables relate directly to the treatment of hogs with serum and the results obtained in the course of our field work. This year, opportunity has been afforded to continue certain observations made last year and to extend these observations to some other subjects. Table V summarizes the sources of infection as reported by field inspectors in 2,791 outbreaks of hog cholera in 1914. The sources of infection have been arranged in three groups. The first includes nearby sources of infection; the second, distant sources of infection; and the third, indefinite, or possibly I should say indeterminate sources. It will of course be understood that the sources of infection as given here were not determined with absolute certainty. Such a thing would be impossible; but inspectors in the field have been instructed to make careful inquiries at each infected farm,
and the results here reported are a summary of their conclusions. I believe these figures are of value, particularly for use in an educational way among farmers, to point out the sources of danger to which they are subjected. Approximately 57 per cent of the outbreaks appear to have come from nearby sources; 23 per cent from distant sources, and 19 per cent are reported as indefinite. It is probable that the indefinite sources of infection should be included in the second group, which represents infection brought from a distance, because nearby infection, if it existed, would certainly in most cases be discovered by the inspector.

Table V.

SOURCES OF INFECTION AND WAYS IN WHICH CHOLERA MAY REACH THE HERD. SIXTEEN COUNTIES, 1914.

<table>
<thead>
<tr>
<th>Per Herds cent</th>
<th>Herds cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchanging labor and visiting infected premises.. 645 23.10</td>
<td>645 23.10</td>
</tr>
<tr>
<td>Exposure to sick hogs on adjoining farms........ 235 8.42 57.68</td>
<td>235 8.42</td>
</tr>
<tr>
<td>Harbored infection .................................. 463 16.59 per cent</td>
<td>463 16.59</td>
</tr>
<tr>
<td>Dogs ................................................. 267 9.57</td>
<td>267 9.57</td>
</tr>
<tr>
<td>Infected cars and public highways................. 33 1.18</td>
<td>33 1.18</td>
</tr>
<tr>
<td>Purchase of new stock ................................ 95 3.40 23.46</td>
<td>95 3.40</td>
</tr>
<tr>
<td>Contaminated streams ................................. 45 1.61 per cent</td>
<td>45 1.61</td>
</tr>
<tr>
<td>Birds ............................................... 482 17.27</td>
<td>482 17.27</td>
</tr>
<tr>
<td>Indefinite ........................................... 526 18.86 18.86pct.</td>
<td>526 18.86</td>
</tr>
<tr>
<td>Total ................................................. 2,791</td>
<td>2,791</td>
</tr>
</tbody>
</table>

REINFECTIONS.

One of the subjects that interests the farmer most and which is undoubtedly of great importance to him, is frequently presented in the form of the question: "When my hogs are treated, how long will they stay immune?" Now, we knew from experimental work that hogs treated by the serum alone may remain immune from three weeks to three months, and we know further that the simultaneous method, as determined in an experimental way, produces an immunity which appears to last in most cases for life. It is believed by some, however, that the immunity produced in young pigs is not as lasting as in older animals. It seemed very desirable to obtain data this year concerning reinfections of treated herds, because after all we are interested in knowing the percentage of reinfections which will take place under practical conditions. Although we know that pigs treated with serum alone would again become susceptible within from three weeks to three months, it may be that in practice this fact is not so great a draw-back as it may seem. It is possible that the percentage of reinfections would be so small as to make the danger from that source negligible when viewed from the standpoint of a sanitary official.

Table VI gives the results of observations made in all of the sixteen counties in which we worked in 1914. In a large number of these counties the work did not begin until midsummer, and in some of them not until September and October, so that in some cases there has not been an opportunity afforded, by the lapse of time, for the serum immunity to run out; such as would be the case in counties in which the
work was carried out during the entire year. Nevertheless, the figures are presented for your information. As you will see, of 1,154 herds treated by the simultaneous and serum alone methods combined, there were 15 cases of recrudescence of disease, or 1.29 per cent. This method of treatment consists in giving to the apparently well hogs in infected herds, the simultaneous injection, and to those hogs which are apparently infected, as shown by high temperature or other signs, the serum alone. In the serum alone herds which are shown in the second line, all hogs in infected herds (both those apparently well and those infected) are given the serum alone treatment. In these herds there was a recrudescence in 5.54 per cent of the cases.

**Table VI.**

**REINFECTIONS.**

<table>
<thead>
<tr>
<th>Mode of treatment</th>
<th>Number of herds</th>
<th>Number of recrudescence</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simultaneous and Serum alone combined</td>
<td>1,154</td>
<td>15</td>
<td>1.29</td>
</tr>
<tr>
<td>Serum alone exclusively</td>
<td>1,605</td>
<td>89</td>
<td>5.54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,759</strong></td>
<td><strong>104</strong></td>
<td><strong>4.87</strong></td>
</tr>
</tbody>
</table>

**Table VII.**

**RECRUDESCENCE OF DISEASE IN TREATED HERDS.**

Montgomery County, Indiana, Dallas County, Iowa, and Pettis County, Missouri, 1914.

<table>
<thead>
<tr>
<th>County</th>
<th>Simultaneous and serum alone combined</th>
<th>Serum alone exclusively</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of herds treated</td>
<td>No. of cases</td>
</tr>
<tr>
<td>Montgomery, Ind.</td>
<td>268</td>
<td>1</td>
</tr>
<tr>
<td>Dallas, Iowa</td>
<td>174</td>
<td>3</td>
</tr>
<tr>
<td>Pettis, Mo.</td>
<td>0</td>
<td>321</td>
</tr>
</tbody>
</table>

Table VII gives the results in the three counties in which we began work in 1913, and in which the observations have extended over the entire year 1914. As you will see, in Montgomery County, Indiana, out of 268 herds treated by the simultaneous and serum alone methods combined, there was one case of reinfection, and in Dallas County, in 174 herds, there were 3 cases of reinfection, giving percentages of 0.3 and 1.7, respectively; in the serum alone herds in Montgomery County, 55 herds, no reinfections; in Dallas County, 31 herds, 1 reinfection; in Pettis County, 321 herds, 43 reinfections, or 13.3 per cent. It should be explained that the serum alone herds in Montgomery and Dallas counties, shown in the right hand section of the table, were treated after November 1, 1914. On account of the foot-and-mouth disease out-

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*These herds were treated between November 1st and January 1st; therefore, in most cases sufficient time for reinfection had not elapsed when this summary was prepared.*
break, we temporarily discontinued the shipment of hog cholera virus from Ames, owing to the difficulty of securing calves for a proper test of the virus to determine its purity. The observations here recorded were made and summarized on January 1, 1915; therefore, in the serum alone treated herds in Montgomery and Dallas counties, a sufficient time for reinfection had not elapsed at the time this table was prepared.

SEASONAL PREVALENCE OF HOG CHOLERA.

We have all heard a great deal concerning the seasonal prevalence of hog cholera, but so far as I know, no definite statistics relating to this subject have been collected. I have, therefore, from the reports of our field inspectors in the three counties of Dallas, Iowa; Pettis, Missouri, and Montgomery, Indiana, collected the number of outbreaks reported in these counties by months and have, from these figures, constructed Chart A. This chart would, of course, be much more impressive if it included the entire sixteen counties, but as we have worked in only three of these for the entire year it was not considered advisable to include the others in this chart. I hope that by another year this data will be much more extensive and thereby made more authoritative. The chart presented shows, at least in these three counties, what we have always believed to be true—that hog cholera is vastly more prevalent in the fall than at any other season of the year. It is recognized, however, that the season of greatest prevalence may vary in widely separated sections of the country.
CHART A.

1914

SEASONAL PREVALENCE
of Hog-Cholera in 3 COUNTIES.
<table>
<thead>
<tr>
<th>County</th>
<th>Date Begun</th>
<th>Hogs Raised</th>
<th>Hogs Died</th>
<th>Hogs Raised</th>
<th>Hogs Died</th>
<th>Hogs Raised</th>
<th>Hogs Died</th>
<th>Hogs Raised</th>
<th>Hogs Died</th>
<th>Hogs Raised</th>
<th>Hogs Died</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decatur, Georgia</td>
<td>8-25-14</td>
<td>48,418</td>
<td>8,546</td>
<td>52,797</td>
<td>12,225</td>
<td>56,000</td>
<td>11,618</td>
<td>211</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin Falls, Idaho</td>
<td>7-6-14</td>
<td>47,673</td>
<td>3,163</td>
<td>82,563</td>
<td>12,978</td>
<td>100,000</td>
<td>1,269</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kankakee, Illinois</td>
<td>6-20-14</td>
<td>46,835</td>
<td>9,000</td>
<td>41,700</td>
<td>7,000</td>
<td>30,500</td>
<td>1,800</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hendricks, Indiana</td>
<td>9-3-14</td>
<td>66,259</td>
<td>13,532</td>
<td>72,211</td>
<td>12,908</td>
<td>85,955</td>
<td>4,065</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montgomery, Indiana</td>
<td>7-5-13</td>
<td>77,403</td>
<td>24,404</td>
<td>78,813</td>
<td>5,136</td>
<td>85,119</td>
<td>2,296</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay, Iowa</td>
<td>7-10-14</td>
<td>73,065</td>
<td>25,000</td>
<td>87,952</td>
<td>80,266</td>
<td>89,874</td>
<td>4,209</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallas, Iowa</td>
<td>7-1-13</td>
<td>84,618</td>
<td>19,821</td>
<td>118,550</td>
<td>12,000</td>
<td>138,320</td>
<td>6,810</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marshall, Kansas</td>
<td>7-6-14</td>
<td>65,294</td>
<td>3,853</td>
<td>72,036</td>
<td>7,230</td>
<td>65,592</td>
<td>3,432</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Henderson, Kentucky</td>
<td>7-22-14</td>
<td>35,814</td>
<td>8,743</td>
<td>30,866</td>
<td>3,934</td>
<td>20,000</td>
<td>2,907</td>
<td>145</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branch, Michigan</td>
<td>5-28-14</td>
<td>46,170</td>
<td>1,209</td>
<td>55,338</td>
<td>4,039</td>
<td>57,878</td>
<td>715</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renville, Minnesota</td>
<td>5-8-14</td>
<td>65,790</td>
<td>8,998</td>
<td>85,699</td>
<td>43,403</td>
<td>100,722</td>
<td>5,069</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pettis, Missouri</td>
<td>8-1-13</td>
<td>59,661</td>
<td>18,853</td>
<td>107,151</td>
<td>6,386</td>
<td>136,030</td>
<td>5,847</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gage and Jason, Nebraska</td>
<td>3-31-14</td>
<td>76,591</td>
<td>5,445</td>
<td>80,949</td>
<td>6,012</td>
<td>71,059</td>
<td>3,541</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allen, Ohio</td>
<td>6-24-14</td>
<td>68,655</td>
<td>10,470</td>
<td>80,719</td>
<td>11,385</td>
<td>105,000</td>
<td>1,027</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davison, South Dakota</td>
<td>10-6-14</td>
<td>39,920</td>
<td>2,270</td>
<td>57,635</td>
<td>16,248</td>
<td>45,430</td>
<td>4,891</td>
<td>107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maury, Tennessee</td>
<td>7-21-14</td>
<td>73,234</td>
<td>8,399</td>
<td>69,787</td>
<td>6,360</td>
<td>70,250</td>
<td>3,194</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                      | Totals     | 975,400     | 171,706   | 1,175,827   | 197,510   | 1,256,729   | 62,690   | 49          |

In 1914 sixteen counties lost 134,820 fewer hogs than in 1913.
Table VIII shows hogs raised and hogs died of hog cholera in sixteen counties, 1912 to 1914, inclusive. It does not seem desirable to go over the entire table, but I will ask your attention to Montgomery County, Indiana; Dallas County, Iowa, and Pettis County, Missouri. As you will see, in Montgomery County, Indiana, the number of hogs raised is increased from 77,403 in 1912 to 85,119 in 1914, and the number of hogs lost from hog cholera is decreased from 24,404 in 1912 to 5,296 in 1914. In Dallas County, Iowa, the hogs raised have increased from 84,618 in 1912 to 138,220 in 1914. In Pettis County, Missouri, there has been an increase from 59,661 in 1912 to 136,030 in 1914, and the deaths from hog cholera have decreased from 18,853 to 5,847. The tables show that the entire sixteen counties in 1914 lost 134,820 fewer hogs than in the year 1913.

**Chart B.**

Losses per 1000 of Hogs from Hog-Cholera in the United States 1894-1913 Inclusive.

Chart B shows hog cholera in the United States from 1894 to 1913, inclusive. The figures from which this chart is constructed were furnished by the Bureau of Crop Estimates of the United States Department of Agriculture. As you will see, the high point is in 1897. The next high point was noted in April, 1914, when the last statistics were made up. If we turn now to chart showing hog cholera in Great Britain (Chart C) you will see that the curve is almost identical in its general
characters with the curve for hog cholera in the United States. The figures from which this curve is constructed, represent hogs slaughtered on account of swine fever, and were secured from the reports of the British Board of Agriculture and Fisheries, from 1894 to 1913, inclusive. In England, so far as I am able to ascertain, during the past 20 years, they have been endeavoring to eradicate hog cholera by very strict measures of quarantine, disinfection, and slaughter of hogs on infected premises. The chart shows that notwithstanding these measures, hog cholera has increased, in England, during the past 10 years. The charts seem to me to be of interest to us here as indicating what might be expected should a campaign for control by strenuous quarantine measures be undertaken.

**CONCLUSIONS.**

By means of the charts and tables which I have presented to you, I have endeavored to convey some idea of the observations made by the Bureau of Animal Industry during the past year. I have no doubt that there will arise in the minds of some of you the questions: What does this work prove as to the feasibility of controlling hog cholera? or, Have we found a plan by which hog cholera can be controlled? It may be remembered that during the first year, when we started the
work in Dallas County, Iowa, Pettis County, Missouri, and Montgomery County, Indiana, the plan was to immediately treat each infected herd which was discovered, and to surround this herd with a zone of animals immunized by inoculation. We had not proceeded far with this work in 1913, however, before we found that such a plan was not practicable. In the first place it did not serve, in all cases, to immediately stop an outbreak of hog cholera. We might immunize all hogs on farms immediately surrounding the infected centers, and yet have the disease appear a mile or so distant, thus necessitating the treatment of another diseased herd and of four or five exposed herds surrounding the new center. This condition is readily explained by the table which I have shown, dealing with sources of infection. We have seen from that table that the disease is frequently carried for long distances by birds, and in other ways. The second objection to this plan was found to be the expense, because for every diseased herd it was necessary to treat from four to six non-infected surrounding herds. While this extensive inoculation might be justifiable were it effective, it becomes a fruitless waste when the spread of the disease is not thereby stopped.

In the year 1914 we changed our plans and confined our work largely to the treatment of infected herds, and instead of placing a zone of immune animals around the infected center, our inspectors were instructed to place a ring of educated farmers around the infected centers. By "educated" I of course mean educated in matters pertaining to hog cholera. This was to be accomplished through visits by our inspectors to the farms surrounding an outbreak for the purpose of advising the neighboring farmers of the location of the infection, and of instructing them concerning the methods of prevention. From the results secured this year it seems that this plan also is in some respects disappointing. Hog cholera in the three original counties in which we started work has, notwithstanding our efforts, been quite prevalent during the year 1914. We have, however, succeeded in accomplishing one thing—we have made a great saving in hogs that previously died of hog cholera, which, after all, is the object we seek. In addition, we have succeeded in instilling sufficient confidence into the minds of farmers to induce them to greatly increase the number of hogs raised. It seems that at the present time any attempt to eradicate hog cholera by means of vigorous sanitary police measures, would be foredoomed to failure. The question arises whether we should not rather turn our efforts toward the problem of saving as large a proportion as possible of the enormous numbers of hogs which die yearly from hog cholera endeavoring at the same time to gradually lessen the amount of infection in the country by the enforcement of reasonable and not too drastic measures of sanitation coupled with an educational propaganda. Farmers should have explained to them the ways in which hog cholera is spread, they should know what to do to save their hogs if they contract hog cholera. However, in explaining to farmers how hog cholera is spread, we should be careful not to assure them that their herds will remain free from hog cholera if they adopt these suggested precautions, because it is more than likely, under the present conditions, especially in the Corn Belt of the United States, that notwithstanding precautions hogs will still contract hog cholera. Farmers should be taught that by adopting certain precautions they will reduce their liability to disease.

We hope to continue our experimental work during the present
year, and I trust that information thus secured will be of value to us all in pointing the way for the effective control of the losses from hog cholera.

UNIFORM METHODS FOR CONTROL OF HOG CHOLERA

Paul Fischer, Columbus, Ohio.

I am ashamed to start out by saying that I am like the school boy that has not got his lesson, because he had to stay home and work. I came late besides. But I do not like to flunk altogether so I have decided to stand up before you anyway and try to say something. The subject which is announced for me, "Uniform Regulations for the Control of Hog Cholera," has not occupied my mind very much, and I will not say very much that applies directly to that subject, but I will try to make remarks that will apply indirectly at least.

Now the object of having uniform regulations in this work is to make it more effective, and I believe that anything in hog cholera work that will help things along in this line and make our work more effective and teach us something that we can use practically, will be accepted as properly belonging under this head.

Now I have decided to make a brief report, or give you, rather, a summary of the preliminary report on the results of experimental hog cholera in Fayette County, Ohio. As you may know, we are conducting in Ohio two experiments with hog cholera control. One of these is conducted in cooperation with the United States Bureau of Animal Industry, and has been referred to in Dr. Dorset's talk. The other is an experimental undertaking in Fayette County with funds furnished exclusively by the State of Ohio.

When foot-and-mouth disease was first discovered in Ohio, in the first few days of November, we were short of help, like everyone else, and the first thing that happened was that the Federal Government found it necessary to withdraw some of the Federal force from the Allen County work, and we soon had to do the same, until everybody was out of the field. Our Fayette County work was begun nearly a year before the Allen County work was started. We felt that we would like to save that, as least, at any expense. We had from six to eight men in the county, but before we got through with our preliminary foot-and-mouth disease work we only had two or three, and at the most, four men left in the field at the very time when we needed them most, October, November and December.

Now the results show the effects of the cessation of our work in Fayette County. Just a few preliminary remarks before I give you the results. Our Fayette County work was carried on with a state fund of $20,000 appropriated for the purpose of experimental hog cholera eradication in a restricted area. Fayette County was selected for that purpose. The money was appropriated early in 1913 and Fayette County was selected for the field of operation. The reason we selected Fayette County was two-fold. In the first place, Fayette County is one of the principal hog raising counties in the state. It is practically permanently infected with hog cholera, in the second place, a committee or delegation of a dozen men was sent up from Fayette County to meet with the Board of Agriculture, and request that this work be carried on in Fayette County. This delegation had a petition signed with 3,700 names of citizens of Fayette County asking for this
work. Taking all that together we thought that would be a good place to start. We did not get started with our work until late in the fall of 1913. We were absolutely ignorant as to the exact conditions that existed in Fayette County except to this extent, that it was one of the large corn-producing, hog-growing counties in the state, and there was plenty of cholera down there; that the people used serum extensively for some years, and that the people wanted the work done, and that is about all we knew. We knew we had $20,000 to be used for it, and before we took the work up actively we divided the county up into ten townships and sent down two or three inspectors at first, assigning a township to each, and had them cover the whole county, and visit every farm and every farmer and talk to him. These men averaged eight to ten farms per day, and they had an automobile, so you can imagine how much time they spent on each farm—from half an hour to an hour, or even longer. The object was to get in touch as closely as possible with the owners of the swine, explain to them just exactly what we wanted to do and what we wanted them to do, and incidentally, but not less important, we wanted to find out what kind of an attitude they assumed toward this work. Well, it took up nearly six months to cover the ground.

Now it is interesting in connection with this, that when we asked for the appropriation to carry on this work we asked them for $30,000—that was the estimated cost of carrying on the work—and we got $20,000. We based that estimate mostly on other estimates, guess work, and on the fact that Fayette County contained 41,000 hogs. That was the number on which taxes were paid for the previous years. When we got through with our work and had the hogs counted we found that instead of 41,000 hogs in Fayette County there were 165,000, a little more than four times as many. Now that speaks well for one thing, if not for some other conditions that existed in Fayette County; they had a large number of hogs there. It showed that the people could raise more hogs in Fayette County than they let on when the tax collector came around, anyway.

Our plan of campaign was to be this; while we went from one farm to the other we not only talked to the farmer but we looked at the hogs and counted them and examined them, and on every farm where hog cholera existed at the time we placed a quarantine, and put a yellow placard at the front gate. The farmers did not like that, but when they found out that the fellows that did not have hog cholera were also to get a placard, a white one, with an appropriate warning on it for owners of sick hogs to keep off, and a warning on the quarantined premises for owners of well hogs to keep off, they submitted to it, and we did not have any trouble. The advantage of having the two placards was that there were only enough placards to go around, one for each farm in the county, and if one was missing we knew that there was something wrong, and we could make an investigation and supply another. In addition to that we placed a large quarantine sign on every highway, public highway, railroad or other road, at the entrance or at the boundary of the county, warning people that Fayette County was quarantined, that no hogs of any kind could be taken into the county without a health certificate and a permit, and nothing could be taken out, either for slaughter or any other purpose except with a permit, after inspection.

Now if the people in Fayette County had known that that was
what we were going to do, we would not have gotten a petition signed by 3,700 names asking that we do the work down there, because they did not like to be controlled to that extent. When they sent in that petition they only thought of one thing, and that was free serum and that suited all of them, but they got their free serum, and they got these other things extra. After a few months they got used to this control work, and they submitted very gracefully. Before beginning the work we took the precaution of getting acquainted with the local prosecuting attorney and explained to him what we planned to do; that we did not want to persecute any of these fellows, but we had certain regulations that we intended to carry out, and that in order to do it, to make this a success, we wanted his help if we needed it, and we had his promise of hearty co-operation. Now to the credit of the people in Fayette County, let it be said that we did not need to prosecute. We had to make mild threats to a few of them, but that is all. They all toed the mark in that respect.

In addition, we ordered every public stock yard in the county to be cleaned up, disinfected, and kept that way, and quarantined all of the yards. We did not allow a pig to be moved over the public highways except under a permit. If they were exposed to infection in any way they had to be hauled in a wagon. In fact we enforced that with most of the healthy hogs. Those were the things that hurt and hampered our work a little, but we got by with it all right.

Now this summary that I want to give you covers about one year's work. It ends January first. We really, however, did not begin the actual work until late in March. The preliminary canvass or survey of the territory was begun late in September and in October. Before we were through with this preliminary work we began to enforce a program of vaccination, and so on, but the work practically begins with the first of the year, because there is very little cholera reported, very little occurring during the winter months, so what we have here is practically for the year beginning with January 1st and ending December 31st, 1914. About the middle of November I made a summary similar to this. I intended to use it at a farmers' meeting to show them how we were getting along. I want to say here that that summary looked quite different from what this one does. It looked much more favorable. Now the explanation of the unfavorable turn that this took, and that is the only tangible explanation I can give here, is that on the first of November we practically ceased activities. We only had half, or one-third, as many inspectors at the busiest time as we had during the more favorable season of the year. So while I believe this report shows progress and is encouraging, I don't think that it does show—I know that it does not—what it would have shown if we had not been interrupted in our work at the most critical time, during the month of November.

Now here is the summary: In the first place when we visited these farms we got first hand from the farmer information in regard to the prevalence of hog cholera, and his own personal losses for a period of four years, 1910, 1911, 1912 and 1913, and put that down. In the first place, Fayette County contains 1,879 farms. All except about 100 of these farms had swine on them. Practically every farm in the county had swine on it. In 1910 there were 100 farms in Fayette County affected with hog cholera. The loss was 3,500 swine. I am just giving it in round numbers. The average deaths per farm, 35.
The average loss per farm, $269. The total loss for the year, $27,000.

Now I have got the same information for every year, and it is hard to give it to you so you can remember it, without a chart, but I will give you each item separately for the string of years, and I think you can understand it best, or keep it in your mind best that way.

Now for the four years, 1910, 1911, 1912, and 1913 the number of infected farms was in this order: 100, 872, 258, and 246. In 1910, 100, in 1911, 872. Now there is an interesting coincidence there. In 1910 we began using hog cholera serum extensively in Fayette County, in fact in Ohio, but in Fayette County we did more work than anywhere else; that is another reason why we started the work there, this experimental work. So with the 100 farms infected when we began our serum work, and 872 infected the next year, there was only one conclusion to be drawn, and that was that the serum did it, and the serum had to assume the responsibility for the extraordinary amount of hog cholera that year. But we have the record of the amount of serum sent down there, and every year since then we have had more serum sent down there. We have always used the serum virus treatment unless the pigs were evidently infected, and then we used serum alone.

In 1910 there were 100 farms, in 1911, 872, in 1912, 258, and in 1913, 246 farms, gradually coming down after that.

The total number of deaths of swine for the first year, 1910, was 3,500. The next year 40,000, that is, within 1,000 of the entire number of hogs that they were supposed to have down there, but actually 25 per cent; the third year, 10,000; the fourth year, 7,916. Now the average death rate per farm was in this order for those years: Thirty-five, 46, 38, 32. If you had this in detail you would notice immediately that the average death rate of course, is in exact proportion to the total number of deaths, but it increases per farm as the prevalence of the disease is extended. That is, the greater the prevalence of the disease, the greater the number of outbreaks, the greater number of deaths on each individual farm. That is interesting in studying the value of the final summary. Now the average loss per farm is in the same proportion. The first year, $269 per farm, the next year $311, the next year $242, and the next year, $220.

The total loss per year is as follows: The first year $26,000; the second year, $271,000, that is, over a quarter of a million dollars loss in just one county. The next year $62,000, and the fourth year $54,000, gradually going down, with the increasing use of serum. But remember that this serum was used absolutely without any system or method. The fellows that had the money and knew about it used the serum.

Now an interesting point in connection with this is, that while there was used in Fayette County—this is virtually estimated, but I think it is fairly accurate—in 1913, $25,000 worth of serum, most of which was furnished by the state—and that is the fourth year in which serum was extensively used—there were farmers in Fayette County that had never heard of serum. We thought that that very thing showed that we did not make a mistake in spending the money to go around and visit every farmer personally and tell him that we were there, what we were going to do, and what we wanted him to do.

Now just another point that I should have made before. Besides the precautions of quarantine regulations, etc., that we enforced—we planned to enforce, and did so far as we could—the next thing incorporated in our plan was, first, to restrict the movement of swine to
quarantine; and second, where we found infection to isolate by quarantine as much as possible the infected herds, to clean and disinfect the premises; and third, to give this treatment. We limited our activities almost entirely to treatment of the sick herd. We did not attempt to treat a circle of exposed farms. We did not do that for various reasons, and the most important one you will see before I get through. We simply treated the infected herd that was reported to us, and in a few cases where very valuable herds were directly and comparatively dangerously exposed, we treated them also, furnished the serum free in all cases, and used the double treatment in all cases.

There are in Fayette County 1,879 farms. During the four-year period that we have just discussed there were 1,450 with hog cholera on them—three-fourths of them, anyway. Now that 1,450 is not the exact number, it is only a round number. I believe there were a few more farms, but that is approximately correct, 1,450 farms out of 1,879. We made a map—and I am sorry that I haven't got it here with me—that shows every farm in Fayette County that was infected with hog cholera during those four years, and those farms are shaded black. Those that were not infected are shown in white. There is not a white farm in that county, on that county map, that is not next to one that is shaded. In other words, there are no three white ones together; I might almost say there are no two white ones together. There was not a farm, therefore, in Fayette County, that did not either have cholera on it or cholera next to it. So that practically the whole county was infected, saturated with infection when we began this work.

In 1913 the number of infected farms had gradually been decreasing. There were 246 infected farms in 1913. In 1914 there were 452—exactly twice as many. I should have explained before stating this, that nearly every farm in the county was infected with hog cholera before we began. We had no means of preventing the outbreak of hog cholera on any farm; before we had any reason to suspect that it was coming, it would break out. The best that we could do was to treat the hogs after it broke out. But I am getting a little ahead of my subject. One of the instructions every farmer got was this: It was his business to watch his hogs; that we could not do this work successfully without his co-operation; it depended on him. We would do our part, but he must do his part. The one thing that he had to do was not only to observe the quarantine, but he had to notify our agent at the county seat immediately when he noticed that a pig in his herd was sick, and we promised in return that we would have a man there within twenty-four hours, unless something unavoidable prevented; that we would have a man there within twenty-four hours to treat his hogs free. Now that was the bargain that we made, that every farmer should report his hogs just as soon as they were sick, whether he thought it was cholera or not, and we would be there that same day or the next day. Now as a matter of fact we visited twice as many farms as we treated for hog cholera. Half of the reports proved to be false alarms; they were not hog cholera.

Now so much for that. In 1914 we had 452 infected farms as compared with 246 the year before—nearly twice the number. However, the number of deaths in 1913 was 7,900, and in 1914, 7,700. We had fewer deaths in the year of experimental control, with twice the number of infected farms. The average number of deaths per farm in 1913 was 32; in 1914 it was 17. We cut the number practically in half. The
average loss per farm in 1913 was $220, the lowest that it had been in a period of four years, and in 1914 it was $100. The total loss for the year 1913 was $54,000; in 1914 it was $43,000.

Now these figures that I have given you do not show very much on the face of them. They show that by serum treatment we reduced the loss one-half practically; that is the actual result. Without further study of other things and other conditions that we found to exist, that would perhaps not mean very much, except that I want to say in this connection: In 1913 there was used in Fayette County serum to the value of $25,000. That serum was mostly furnished by the state, and partly furnished by private concerns, and we estimate the value of the serum at $25,000. In 1914 the value of the serum that we used was $27,500. Now here is the point I want to make: We used a little more serum the second year than was used the first year. It was practically the same amount, though just a little more. But with twice the number of outbreaks of hog cholera, we used practically the same amount of serum, showing the difference between the systematic use of the serum and the uncontrolled use of the serum; that is the economical difference. We got twice the benefit out of it the first year when we were first learning, and when the farmers were first learning.

Here comes another interesting point, to remind you again of that which we cautioned the farmers they had to do. They had to report the first appearance of the disease among their swine. Now, of course, they did not all do that. We have got those fellows divided into two classes—owners of herds that reported promptly, and owners of herds that reported delinquently. We stretched things a little for the former. In the class of owners of herds that reported promptly we included everybody that reported the disease before more than one hog was dead. We gave them just that much grace—one dead hog. We thought there was no excuse for anybody reporting his herd at a later date than that. Now, 358 farmers reported their herds promptly before more than one hog died. They lost a total of 718 head, or an average of two hogs per herd. Two hundred and eighty-five farmers reported delinquently. They lost 6,314 head, or an average of 22 per herd. It doesn't take much thinking to see where the trouble is, and where the best solution of the problem is, and where we can learn in the future. Well, now, we feel that these fellows who did not report promptly this year will report promptly next year when they see this report.

These further remarks may be interesting. The owners of herds that reported the result of the treatment as satisfactory were 523. The number that reported the treatment as unsatisfactory was 54. I want to say in connection with this that some of these men did not report their hogs until half of the hogs were dead. A herd of 200 head had lost from 50 to 100 head before it was reported. Then there were 64 who did not commit themselves as to whether they were satisfactory or not, and 22 did not report.

The total number of swine treated was 56,000 head. Now, mind you, that was only animals infected or directly exposed animals, animals out of infected herds. That statement shows what it would mean if we had not stopped at that point but had gone on and had tried to treat every exposed herd. That would probably have meant the treatment of every hog in the county, or 165,000 instead of 56,000. That would have been, of course, impracticable; it would not have been scientific. Now, out of the 56,800 swine that were treated, 2,897 died before treatment.
That speaks against the farmer. Four thousand eight hundred and forty-four died after treatment. To give you an idea of the work connected with this, we shipped out of the county, under affidavits, 81,000 head of swine. Before the foot-and-mouth campaign began it was a matter of personal inspection and certificate, and after the foot-and-mouth campaign began, we required affidavits. That indicates the great amount of work connected with this. The eight inspectors we had in that county were kept busy day and night, and we had three and sometimes four automobiles running, and they wore them out while they used them, during this period.

Now as to the business end of it. The total amount of serum used in this work was 89,000 twenty c.c. doses, valued at $1.25 cents per c.c., or in round numbers, of a value of $27,000. The total estimate of the salaries for the men that were engaged in this work, the inspectors, was $7,400. These men were paid their traveling expenses and their board bills and those expenses amounted to $2,360. Then there were the expenses for running three automobiles, $1,580. These need not have been as great as they were, but the fellows that ran the automobiles were veterinarians and not chauffeurs, and they did not oil their automobiles half the time, and therefore wore them out. The expense of office rent was $162; telephone service, $85, and stenographer—I only had the stenographer for about three months—$150. The value of the serum was $27,000, in round numbers, and the total cost of the work, $38,582.50.

Now the money we saved, without going into any theory about it, but just taking the actual saving, was as follows: We treated 665 herds, or a total of 56,000 animals; we reduced the loss from cholera in 1914 below that of 1913 by fifty per cent; and we used practically the same amount of serum. That is the point that I want to make, with the same amount of serum used systematically we got along with just half the loss. I think that is an important thing, a favorable showing. It shows a great deal. It is encouraging, because the serum is an expensive thing to use, and the sooner we can get along without serum, or with the lowest amount of serum possible, the more favorable and the better will be the prospects of ultimate success in serum work. We feel further, that for the present the serum double treatment—the serum virus treatment—is the only effective means of obtaining permanent results. We think that in the course of a few years, when we have perfected our methods, have taught the farmers to be more prompt in reporting their outbreaks, when they have been taught to clean up and disinfect premises effectively, and when we have learned how to enforce effective quarantine regulations, we will come to a point where we will reduce the number of outbreaks of hog cholera to a minimum, as far as possible, with the use of serum double treatment; when that time comes then probably we will resort to the use of serum alone until we get rid of the disease entirely. We do not look for any ending like that before three or four years, but as it is we are looking into the future with a great deal of hope. (Applause.)

STANDARDIZATION OF ANTI-HOG-CHOLERA SERUM.

Thomas P. Haslam, Manhattan, Kansas.

The accurate testing of anti-hog-cholera serum is of great importance. If serum, not fully potent, is used in the serum simultaneous
vaccination, serious outbreaks of cholera may be produced. The usual method of testing anti-hog-cholera serum is too well known to need recounting. The accuracy of the method, doubtless, varies greatly according to the experience and acumen of the one judging the test. A fairly skilful operator can distinguish between non-potent and potent serum by this test. However, it has not been found possible by this test to ascertain with much certainty the relative degree of potency which various lots of sera possess. Tests of a number of sera have shown differences in results which may be illustrated by tests designated as tests A and H.*

None of the pigs receiving serum A became seriously sick. The virus controls developed acute cholera, having high temperatures and definite symptoms on the seventh day. On the other hand the two pigs receiving only 15 c.c. of serum test H developed symptoms. No. 813 even showed some diarrhea. The pigs receiving 20 and 25 c.c. of serum test H did not develop noteworthy symptoms. The virus controls in this test had marked symptoms on the seventh day. According to the accepted interpretation of these tests, A is a "fully potent serum," and H a "weak serum." The latter, therefore, if used in practice, must be administered in greatly increased doses.

The assumption that A is stronger than H must be based on the further assumption that the pigs, used in each test, possessed the same degree of susceptibility and that the virus employed had the same degree of virulence; also that the conditions of temperature, shelter, food, etc., under which the test pigs were held were identical in each test. These suppositions are hardly justifiable. It is known that the susceptibility of pigs from different sources varies. Even in pigs from the same source there are marked variations in susceptibility. Experimental proof of the difference in the susceptibility of pigs from different farms is not at hand.

To illustrate this difference in susceptibility in pigs from the same source, tests designated as C, D, and E may be referred to.

In serum test C, six pigs received 15 c.c. of serum. The pigs were all approximately of the same weight and represented an average lot of susceptible test pigs. Nos. 721 and 722 developed severe cholera and died. Of the other four none developed severe symptoms. If only two pigs would have been used, the results of the test would, obviously, have depended upon the two that happened to be chosen. Had Nos. 721 and 722 been used the conclusion would have been drawn that the serum was weak. On the other hand if any other two had been chosen the serum would have been pronounced strong.

In serum test D, No. 743 became quite sick, but recovered. Here, again, the test would have given different results, according to the pigs selected.

In test E, pigs Nos. 760, 765, and 762 developed symptoms. Two of the pigs recovered, but No. 762 died of cholera.

It is evident from these tests that the individual susceptibility of the pigs varies so markedly that, if only two pigs are used for each rate of serum, then chance alone will frequently determine the outcome of the test. This variation in susceptibility of test animals is by no means peculiar to cholera testing. It is a well-recognized principle

*Because of difficulties from a typographical standpoint in properly reproducing the tables and charts illustrating Dr. Haslam's paper, it has unfortunately been necessary to omit them from the Proceedings.—Publication Committee.
that, other conditions being constant, the accuracy of a biological test is proportional to the number of animals used. In the cholera testing four or five pigs on each dose are required for accuracy, at least when the pigs employed are secured from ordinary sources, for even pigs coming from the same farm often differ in condition, heredity, age, etc.

In discussing the foregoing tests mention has been made of the symptoms. But the temperatures of the test pigs are also important in judging the test. In most cases there is a close agreement between symptoms and temperature. In some instances, however, an atypical reaction occurs in which severe symptoms, even death, are not accompanied by marked thermal reactions.

Of the numerous symptoms which may present themselves, three have been systematically recorded. These three are: Condition as to general appearance, appetite, and bowels. Other abnormal symptoms have been recorded from time to time, if pronounced.

Considerable uniformity as well as brevity can be obtained if symptoms are expressed according to the following scheme:

**GENERAL APPEARANCE.**

a—Normal; anxious to eat, always hungry.
b—Definitely impaired appetite. Will eat a little slop or a little corn; will come to the trough, but finds food repulsive and lies down. May get up and try to eat again. Will, probably, eat a little when corn is thrown.
c—Severely impaired appetite. Will drink some pure water, will taste slop. Does not eat an appreciable amount of food. When corn is thrown in the pig may nose it or even take a little in its mouth but, usually spits it out.
d—Total loss of appetite. Attention is not attracted by food. Sometimes will drink a little water.

e—Moribund.

**APPETITE.**

a—Normal, b—Slight depression, drooping of ears and lethargic expression, tendency to lie down.
c—Pronounced symptoms; lying most of the time, slightly unsteady gait; slight tendency to arch back.
d—Severe symptoms; almost comatose, severe weaving of hind part and arching of back.
e—Moribund.

g—Definitely impaired appetite. Will eat a little slop or a little corn; will come to the trough, but finds food repulsive and lies down. May get up and try to eat again. Will, probably, eat a little when corn is thrown.
h—Severely impaired appetite. Will drink some pure water, will taste slop. Does not eat an appreciable amount of food. When corn is thrown in the pig may nose it or even take a little in its mouth but, usually spits it out.
i—Total loss of appetite. Attention is not attracted by food. Sometimes will drink a little water.

**BOWEL.**

a—Normal.
b—Feces slightly soft.
c—Feces thin, light color, not bloody, sometimes nearly white.
d—Feces even thinner than in c, always dark brown, not definite blood color nor streaked with blood.
e—Feces very thin, dark, mixed with considerable quantities of pure blood; in advanced cases they may apparently consist almost entirely of blood.
x—Indicates constipation.
y—Indicates severe constipation.

These symptoms are supplemented by temperatures taken twice daily. By means of this systematic study of symptoms and temperatures a rather sharp line of separation may be observed between pigs.
receiving a protective dose of serum and those not receiving enough serum to protect them.

A detailed study has been made of 15 groups of pigs, each group consisting of four animals. One group received only virus, another group no treatment, and a third one serum alone. The remaining 12 groups received both serum and virus. Each pig received 2 c.c. of virus. The serum was administered according to the weight of pigs, each group of four receiving the same quantity of serum per pound of weight. The lowest rate administered was 0.1 c.c. of serum per pound, and the highest rate was 10 c.c. The reactions obtained from the pigs receiving serum and virus arrange themselves into three classes according to the doses of serum received.

Serum Reactions.

CLASS I. STRONG REACTIONS.

a—A majority of hogs have during several days temperatures above 104 degrees F.
b—Some individuals develop high temperatures of 106 to 108 degrees and exhibit well-marked symptoms.
c—A small percentage die.
d—The average number of days the individual pigs had temperatures of 104 degrees or higher, is usually at least six days, often being 8 to 12.

CLASS II. MILD REACTIONS.

a—Many pigs do not exhibit temperatures above 104 degrees.
b—High temperatures are not observed. The temperatures are, in general, between 104 and 105.5 degrees.
c—The average of the febrile reactions is, usually, about 3 days.
d—Definite symptoms of illness are not exhibited.

CLASS III. SUSPENDED REACTIONS.

a—Thermal reactions are rare and very slight both in degree and in duration.
b—Reaction, if present, occurs after about 20 days.
c—No symptoms of illness.

On plotting the thermal reactions obtained in the test, we observed a sudden and sharp drop in the curve. At the rate of 0.1 c.c. of serum per pound weight, the average thermal reaction was approximately 3 days.

The serum group, receiving the 0.1 c.c. per pound exhibited the strong, or Class I reactions, i.e., the pigs were not protected from sickness.

Likewise the group receiving the 0.2 c.c. of serum exhibited the mild, or Class II reactions, i.e., the pigs were protected from cholera.

Since the rate of 0.2 c.c. per pound weight protected the pigs, we may designate it as the protective, or P+ dose of serum. It would then follow that the dose of serum which just fails to protect would be called the P— dose. Between the rate of 0.2 c.c. and 0.75 c.c. per pound the reaction remains between one and three days. At 1 c.c. per pound it falls to 0. The reaction between 1.0 and 10 c.c. does not exceed one day. The reaction at this rate almost entirely consisted of delayed reactions, i.e., reactions occurring about the twentieth day after vaccination. The causes of these delayed reactions are not known. No visible sick hogs were present in the test barn for the first 33 days after vaccination.
Some of the non-vaccinated controls also exhibited a mild febrile reaction. These temperatures may have been due to other conditions than cholera; or it may have been that some of the vaccinated pigs were excreting an attenuated form of virus. The pigs treated with 0.1 and 0.2 c.c. serum, as well as the virus controls, were not kept in the same building nor cared for by the same attendant as the remainder of the pigs in the test. The loss of pigs occurring after the thirty-third day may have been due to infection derived from two pigs belonging to serum test C which developed cholera. However, these pigs were removed from the test barn as soon as serious symptoms occurred. They were never in contact with any of the pigs in the experiment. The loss might have been due to a heavy corn ration and lack of exercise as the pigs were housed in pens 6x8 feet.

A study of a tabular summary shows that in the first test the $P^+$ dose is very easily recognized. In the remaining tests, which were not intended as standardization work, but only as ordinary or slightly modified tests, the $P^+$ dose can, in general, be located although the range of dosage or the number of pigs involved is hardly sufficient for satisfactory results.

The $P^+$ dose can only be considered as constituting a method of expressing a condition that is recognized by all competent serum testers. While the conception of the $P^+$ magnitude facilitates comparisons of serum tests it does not eliminate the uncertainty of serum tests. This uncertainty can be eliminated only by comparing each test with an unchanging standard.

Desiccated anti-hog cholera serum will doubtless constitute such a standard, if prepared and stored in accordance with the principles established by Ehrlich. Ehrlich has shown that oxygen, light, heat, and moisture weaken antisera. Accordingly, he desiccated his standard sera in high vacuum over phosphorus pentoxide and stored them in a cool, dark place. We have manufactured such a standard anti-hog-cholera serum, but owing to delay in securing large sealing tubes we can not as yet present data upon its keeping qualities.

When a serum standardization is to be made, standard desiccated serum is dissolved in ten times its weight in sterile distilled water or normal salt solution. A 20-gram tube produces a little in excess of 200 c.c. of solution.

To carry out the test two series of pigs of as near the same age, weight, and heredity as possible should be selected. To one series the standard serum is given, to the other the serum to be tested. Both series receive the same virus and a number of virus controls are provided. The symptoms and temperatures of both series are carefully recorded. The formula.................$P^+ (a)$

\[
\frac{P^+ (x)}{a}
\]
gives the strength of the serum, where "a" represents the standard serum and "x" the unknown serum.

The magnitude of this result is not affected by the various disturbing factors encountered in the ordinary testing. Any influence tending to affect the results given by the serum under test will also affect to the same extent the results given by the standard serum. These disturbing influences are, therefore, eliminated because their effect is the same upon both terms of the ratio. It is, of course, necessary that the $P^+$ dose of each serum, be accurately determined and this presupposes that enough pigs are used to yield accurate results.
The term standardization has been applied to this comparison of the strength of the unknown serum to the standard serum. Serum standardizations have been carried out to investigate some problems in serum production.* The problems were:

1. The relative potency of serum before and after the removal of the red blood corpuscles;
2. The relative potency of a serum before and after drying.
3. The possible deleterious effect of aluminum utensils on the potency of serum.
4. The standardization of one lot of serum for field use.

Thus far this method of standardization has been employed only upon these technical questions. In the near future all of the product of the Kansas State College Serum Plant will be standardized. In order to avoid an increase in the cost of production a large aluminum mixing vat has been purchased. Its capacity is 100 gallons. Since the ordinary testing calls for eight pigs for a test of 20 gallons, it will be possible to combine five tests, thus having about 40 test pigs at our disposal.

It may be mentioned that before mixing such large quantities of serum together, their freedom from serious bacterial contamination will be determined by the plate method, and that probably bleeding tests, according to the method of Fischer and Fitzgerald, will be carried out in order to eliminate any noticeably weak serum.

Method of Manufacturing Anti-Hog-Cholera Serum and Virus.
F. A. Bolser, Indiana.

Previous to the year 1903, very little had been accomplished in the development of a cure for hog cholera, and practically nothing of value had been done toward the prevention of this disease, although there were some local regulations concerning disinfectants, quarantine, and disposition of carcasses. It remained for the United States Department of Agriculture to make the first radical experiments looking toward the elimination of this scourge.

Hog cholera is conspicuously one of the most preventable of live stock diseases, even as it is one of the most hopelessly incurable in its advanced stages. This fact has been demonstrated by the researches of the United States Department of Agriculture. It is to three of the great scientists of this department of the Government that veterinary medicine owes the discovery of the serum treatment. This malady and the names of Doctors Dorset and Niles of the Bureau of Animal Industry should go down in history along with the names of Jenner, Fasteur, Koch and Metchnikoff in the department of human medical science. To Doctor Melvin, chief of the Bureau of Animal Industry, belongs the honor of having placed official resources of the United States Government at the command of these men, thus making possible the successful outcome of their work.

In the last three or four years, much has been accomplished by commercial firms toward placing large quantities of anti-hog cholera serum and virus upon the open market, so that at the present time veterinarians all over the United States have become very proficient in the application of this most useful agent toward the one end, and that is, the advancement of the interests of the live stock owners in this country. But during the past few years, while there has been

much good serum placed upon the market, there has been some which
has been very poor, producing disastrous results in the field and in
some instances discouraging the use of an agent which, if properly
manufactured, must prove very efficient in the hands of the successful
operator, the veterinarian.

It is our opinion that anti-hog-cholera serum and virus should be
manufactured as carefully as anti-tetanic serum and other agents that
are to be used upon live stock. For this reason I am taking the
liberty to suggest some of the most important points with reference
to the technic that should be prescribed for commercial serum plants.

The first and most important point to be taken into consideration
is the location where anti-hog-cholera serum and virus should be man-
ufactured. First, a laboratory of this kind should be situated far
enough away from the dangers of the dust and dirt and contamination
invariably found in our large cities. Second, it should be situated
where the efficiency of the sewage disposal system should be such
that no virulent or infectious material escapes from the boundary on
which the plant is located. Third, a separate building should be built
for every department to avoid the great danger of virus coming in
contact with the serum. Separate equipment should also be installed
in each department. Such equipment should consist of large steam
sterilizers that will accommodate the necessary utensils and such
as will stand more than fifteen pounds pressure for at least thirty min-
utes. Every plant manufacturing serum should have in connection an
ammonia refrigerating system that will insure uniform temperature
at all times.

It is a fact that the foundation of good serum must be started by
having virus of the most virulent strain, consequently pigs used for
this purpose must be procured from uninfected farms and a veterinar-
ian's certificate should accompany all animals received at the plant
regardless of the purpose for which they are to be used. This would
avoid infection from foot-and-mouth disease. All pigs used for virus
should be inoculated upon the premises of the manufacturer immedi-
ately after they have been received; tagged and their temperatures taken,
to be sure that they are not suffering from any infectious trouble. They
should then be placed in small pens where they will not be over-
crowded, and must be made as comfortable as possible. Buildings for
this purpose should be large, well lighted and ventilated. Artificial
heat should be used when the weather demands. This would prevent,
in a measure, pneumonia and other troubles that are liable to mislead
the heads of the virus department.

Virus pigs should be kept under close observation and temperatures
taken daily and they should show visible signs of sickness not earlier
than the sixth day nor later than the tenth or twelfth day. Animals
not showing clinical symptoms of cholera before this time would not
produce anything but virus of low virulence.

After the virus pigs show clinical symptoms of cholera (if within
the required length of time) they are taken to the preparation room,
where, to avoid mistakes, their tag number and temperature are again
recorded. They are washed, dried, their neck is shaved and a disinfec-
tant is applied. They should then be covered with a shroud moistened
with an antiseptic solution. They should then be taken to the final
bleeding room and the field dried with a piece of sterile gauze, they are
then bled into vessels that should prevent as little air contamination
as possible. The blood should then be passed to the defibrinating room
and the carcasses of the virus pigs taken to the post-mortem labora-
tory where a very careful autopsy is held by a competent graduated
veterinarian, for the purpose of satisfying himself that the virus pig
is free from other communicable diseases. At this time a post-mortem
record is made of such evidence of cholera as is found. After post-
mortem the carcass of the virus pig should then be removed to the re-
duction department where they are reduced to grease and tankage.

After the virus has been defibrinated it should be strained through
several folds of sterilized gauze into graduated sterilized cylinders and
immediately placed in the refrigerating room. Virus for simultaneous
use should be procured from pigs that have been inoculated upon the
premises and become visibly sick by the seventh day and show evidence
of cholera to such a degree as would convince the veterinarian in charge
that they would die at least inside of fifteen days. This virus when
defibrinated, strained and graduated should be given a serial lot num-
ber and a portion of it tested upon calves to prove its freedom from
foot-and-mouth disease. To the balance a sufficient amount of pre-
servative is added to equal 1 per cent and is then held until the test
for foot-and-mouth disease is completed. At the same time a small
quantity of unphenolized virus should be sent to the bacteriological
laboratory where a direct examination of the blood is made and the
records of such tests are kept.

Virus used for hypering purposes, after it has been chilled for a
reasonable length of time, should then be taken to the hypering building.

To each immune is given a sufficient quantity intervenously to be
equal to not less than 5 cubic centimeters per pound of body weight. These animals are then placed in clean, disinfected, comfortable quar-
ters where a veterinarian should be constantly in attendance taking
the temperatures daily and seeing that they are well cared for, as a
hyperimmune that is not in perfect health can not possibly produce
good serum.

When the required length of time has elapsed after hypering, the
hyperimmune is taken to the preparation room where he is washed,
dried, and the field is shaved and disinfected. After he is put in a crate
and covered with a shroud moistened with an antiseptic solution, he
is taken to the bleeding laboratory where the blood is drawn either
from the tail or from the large vessels of the throat into containers
that will prevent as little air contamination as possible. All instru-
ments and utensils used by the operators must be previously sterilized.
After the blood has been drawn from these animals it should be passed
to the defibrinating room and after defibrination it should be strained
through several folds of sterile gauze into graduated sterilized cylinders,
After the preservative has been added and a record is made of both
the quantity of serum, the preservative added, and the total, the serum
should be taken to the refrigerating room to await the post-mortem
results of the hyperimmune before it is tested. A quantity of serum
previous to phenolizing should be sent to the bacteriological depart-
ment where a bacteriological examination is made. Each hog's blood
should be kept separate until the animal's carcass has been posted and
the internal organs examined by a competent veterinarian, when the
usual eight-pig test is applied.

During the time the serum, which should be always tested in not
more than twenty gallon lots, is undergoing the eight-pig physiological
test, a bacteriological examination of the serum should be made in
connection with the test already made as follows: Both serum and
virus previous to phenolizing is examined bacteriologically by making a smear on a slide and staining it with Wright's stain and an equal amount of distilled water, allowing it to remain five minutes when it should be washed and dried and examined. Petri-dish inoculations should be made at the same time.

At the time of getting out an equal quantity from each bottle containing serum for the physiological eight-pig test, a sample should be taken from the test bottle and should be subjected to another bacteriological test, the same as mentioned above. Also two samples of one-fifth c. c. each is taken from the test bottle and added to ten cubic centimeters of sterile alkaline beef peptone agar that has been liquefied and cooled to below 50 degrees C. The tube is then flamed and after thoroughly mixing, the contents are poured into a sterile petri plate and incubated at 37.5 degrees C. for forty-eight hours. The colonies on each plate are then counted, each colony representing one bacterium.

Two slant culture tubes, one containing sterile alkaline beef peptone agar and the other glucose gelatin, are inoculated with a small portion of the sample taken from the test bottle. These tubes are then flamed and placed in a Novy jar containing pure hydrogen gas obtained with the hydrogen generator. The Novy jar is then incubated at 37.5 degrees C. for seven days. The tubes are then examined for anaerobic bacteria.

At the time the plates are made a fermentation tube containing alkaline beef peptone bouillon with other agents is inoculated with the sample under test to determine the presence or absence of gas-producing bacteria.

Having determined the number of bacteria per cubic centimeter, the next step, which is a great deal more important, is to determine the kind of bacteria present. This should be done by, first, a very careful study of the culture growth characteristic on the plates, tubes, and fermentation tube. Then a smear is made from each kind of colony growth found on the plates, tubes, and fermentation tube. The smears are dried and stained with various kinds of stains and examined microscopically. If their identity cannot be determined this way, the culture growth in question is tested for endol and acid production, motility, flagella, spore formation, and so forth. If, after these examinations are made, their identity is not determined, or to prove their identity if it is suspected, the animal inoculation test is started. This test consists of introducing into the abdominal cavity or some other part of the anatomy of a guinea pig, or other susceptible animal, a small quantity of a suspension in normal salt solution of the bacteria in question. If the animal dies it will prove that the bacteria introduced were pathogenic and the lesions found on post-mortem with the subsequent bacteriological examination will identify the bacteria that was responsible for the animal's death. This proves that the sample of serum or virus under test contains disease-producing bacteria. In the event that the animal does not die it will prove the sample of serum or virus does not contain any disease-producing bacteria.

In the event of the test animal's death, it will be necessary to determine the number of bottles in the lot that are infected. This is done by taking in a separate sterile test tube a sample from each individual bottle in the serial lot number under test, each sample being tested for the bacteria that have proven pathogenic, and all that are found infected are rejected.
I believe that every lot of serum and virus that is shipped interstate or intrastate should not only bear the serial lot number, the date of expiration, but should undergo the rigid bacteriological examination such as I have already mentioned.

All parties working in or about a plant should be dressed in sterile clothing and shoes, and should avoid in every way any possibility of contamination. Visitors should be excluded at all times, unless these same precautions are carried out in clothing, shoes, disinfecting, etc., as mentioned above.

**THE REFINEMENT OF HOG CHOLERA SERUM.**

John Reichel, Pennsylvania.

The title of my remarks, "The Refinement of Hog Cholera Serum," fully covers the scope of my subject. Nothing more need be said regarding the production of hog cholera serum after seeing the views of the Mooreland Biological Farm included as a part of the presentation by Dr. F. A. Boiser of Indiana.

The refinement referred to here is applicable to all of the recognized forms of so-called hog cholera "antitoxin" of the present day, freshly prepared or old, weak or strong in potency, high or low in bacteria or sterile, of light or heavy consistency.

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**Fig. I.**

Tube No. 1 H.C.S—K.A.E.S.—is hog cholera "antitoxin"—defibri-
nated blood, dark in color and apparently free of bacteria; tube No. 1 H.C. — H.K.M. — is hog cholera “antitoxin” — defibrinated blood, dark in color and rich in bacteria; tube No. 1 H.C.S. — H.K.M. — is hog cholera “antitoxin” — defibrinated blood, brick-red in color and rich in bacteria. The brick-red color is due to particles of finely broken up fibrin not eliminated during the centrifugal defibrinating process used. Tube No. 1 H.C.S. — serum — is the actual serum of blood from hyperimmune hogs freed of bacteria by filtration. Tube No. 1 H.C.S. — plasma — is the serum with the fibrin in the blood from hyperimmune hogs. Coagulation is prevented by the presence of a citrate and oxalate or other salt used for this purpose. Tube No. 1 H.C.S. — dried — is hog cholera “antitoxin” — serum desiccated or evaporated to dryness which may be dissolved in salt solution ready for use.

The first question that arises in the analysis of hog cholera “antitoxin” — defibrinated blood — is whether or not the solid matter, fibrin, cellular debris, etc., possessed any protective substances, and the first experiment in 1913 included this question as a problem. In this experiment some freshly defibrinated blood from hyperimmunes was immediately centrifugalized, the serum drawn off and replaced by isotonic salt solution, shaken and again centrifugalized. The washing of the cellular debris was repeated twelve times and then the heavy suspension of debris was injected into test pigs against test virus. The actual dose injected included many times the amount of cellular debris in a test dose of hog cholera “antitoxin” — defibrinated blood. The results of the test proved conclusively that the cellular debris does not possess any protective substances as reported by Haslam and Franklin.*

The results of this experiment were subsequently confirmed by separating the solids from the liquid portion of hog cholera “antitoxin” — defibrinated blood — with chemical precipitants and filtration. The contents of tube “liquids” and tube “solids” (Fig. I) are samples of hog cholera “antitoxin” — defibrinated blood — treated in this manner. It was again found that the liquids alone included the protective substance. After this experiment several other questions suggested themselves and the second problem to be included in an experiment was to determine how far hog cholera serum “antitoxin” — defibrinated blood, serum or plasma — could be split up without weakening or destroying the protective substances.

*Standardization of anti-hog-cholera serum by Haslam and Franklin of the Kansas State Experiment Station, Manhattan, Kansas. In Jour. Infect. Diseases, Sept., 1914.
GENERAL OUTLINE OF PROCESS.

The general outline of the process shows how hog cholera "antitoxin"—defibrinated blood, serum or plasma—may be treated and the meat substances eliminated from the hog cholera serum globulin.

CUT—FIGURE III

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Fig. III.

Tube No. 4 is the filtrate of the first step from which the serum-albumin (tube No. 7) and pseudoglobulin B (tube No. 8) were obtained; tube No. 9 is the precipitate of the first step from which the pseudoglobulin A (tube No. 17), euglobulin (tube No. 16), and cellular debris, etc. (tube No. 13), were subsequently obtained. Repeated tests on susceptible test pigs of a mixture of the globulins as one of the end products, the serum albumin as another, and the cellular debris, etc., as another, showed that the globulins alone carried with them the protective substance. Subsequent tests showed that the protective substance was associated with the pseudoglobulin alone, and for practical purposes it seems unnecessary to separate the euglobulin from the pseudoglobulin.

It is of interest to note that it is hereby shown that so-called hog cholera "antitoxin" is largely made up of colloids or glue-like substances and not crystalloids. Hog cholera "antitoxin"—defibrinated
blood, serum or plasma—may be split up and the colloids separated by chemical precipitants and filtration. The association of the protective substances of hog cholera "antitoxin" with the globulins reveals a new substance—hog cholera serum globulin—which in no way, however, tends to show that hog cholera "antitoxin" may possibly be a true antitoxin.

A true antitoxin can only be prepared with a toxin to begin with and up to the present time hog cholera toxin is unknown. Hog cholera "antitoxin"—defibrinated blood, serum or plasma—is comparable to anti-rinderpest serum referred to by Hartley,* as follows: "The antitoxins are prepared by the repeated injections of gradually increasing amounts of toxin; anti-rinderpest serum is prepared by the injection of one or more large volumes of virulent material into animals which have been previously immunized against the disease. In the former case the response of the cells involved is to a toxin stimulus; in the latter the response is to a stimulus of the nature of a living organism, and it is conceivable that in the two cases different mechanisms are involved, resulting in the production of immune bodies which, though possessing many common characteristics, possess also points of difference which are manifested in such a property as that of solubility." Likewise hog cholera virus when destroyed by killing the living cause of the disease, in one way or another, will not result in the production of protective substances in serum producing hogs.

The significance of the results of these experiments may be briefly summarized by referring to additional observations already made. A liter of hog cholera "antitoxin"—defibrinated blood—with a recognized dose of 20 c.c. yielded 500 c.c. of the mixture of the globulins—hog cholera serum globulin. It protected test pigs of the same lot and test in 10 c.c. doses. Hog cholera serum globulin is readily freed of bacteria by filtration and preserved in the usual way. The sterile product freed of the inert substances of hog cholera "antitoxin" shows no change on standing in a properly cooled place (35 to 50 degrees F.) and it is gratifying to note that the product is quickly and entirely absorbed. The protection afforded is the equal at least of that of hog cholera "antitoxin"—defibrinated blood, serum or plasma. It has also been demonstrated that the hog cholera serum globulin realized from hog cholera "antitoxin"—defibrinated blood—can be included in one-fourth of the bulk of the original material which means a concentration of at least four times.

Hog cholera serum globulin (tube No. 22+) from hog cholera "antitoxin"—defibrinated blood—is red in color, owing to the presence of hematin or hemoglobin. Hog cholera serum globulin (tube No. 22) from hog cholera "antitoxin"—serum or plasma—is practically colorless and represents the product in its purest form.

Dr. White: Mr. President and Gentleman of the Association: We have had a little experience with hog cholera in Tennessee, and we have had a little experience in seeing eradication in that state. We have made 3,505,000 c.c. of serum

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*On the Precipitation of the Immune Bodies occurring in Anti-Rinderpest Serum, by Percival Hartley, D Sc (Lond.), of the Imperial Bacteriological Laboratory, Mukteswar U. P. In Memoirs Dept. Agric. India, Vet. Str., Vol. 1, No. 4, Jan., 1914
in the last year at the State serum plant, and we have observed some of the results of the use of this serum in the field.

The speakers have brought out some very important points. They have each cleared up a few mysteries, and have thrown light on a few problems, not only in regard to the manufacture of hog cholera serum, but in the field use of the serum. I was especially interested in the remarks of Dr. Dorset and the tables showing the field results in the use of serum for the last year. Our experience in Tennessee would indicate that the use of hog cholera serum will not produce abortion in pregnant sows. I believe we are pretty clear on that point, and Dr. Dorset is too. We are clear from the use of serum in the last year that the abortion produced in pregnant sows by the serum alone or the simultaneous method of vaccination is simply on account of the rough handling of the sows, and not on account of any systematic effect of the serum. We have also come to the conclusion that in order to save young pigs, or suckling pigs on infected premises, it is absolutely necessary to vaccinate these pigs at not more than fourteen days after birth. If we leave pigs on the infected premises longer than fourteen days a number of them develop hog cholera. Our field results would indicate that serum has come to stay. In fact I had not less than three men in one county of our state tell me about a month ago that every hog in their district that had not been treated either by the serum alone method or by the simultaneous method, was a dead hog; that there was not one of them alive; that if it had not been for the use of the serum and the saving of the hogs they would not have had hogs enough in that district to have produced meat for as many as five families.

Dr. Connaway: Mr. Chairman and Gentlemen: We have had some very excellent papers here at this session, and as we meet year after year we are getting closer and closer to the solution of the question of the eradication of hog cholera. That is the solution that we want—eradication. At the present time we are engaged in immunization rather than eradication. Immunization is an excellent thing; it saves hogs, and as long as we have got the infection on our farms and as long as we keep that infection on our farms, we must immunize. But we should, as sanitarians, separate the two important things, of eradication and immunization. By immunization Dr. White in Tennessee is able to put those pigs in a condition so that they live on infected grounds. But the big problem before us as sanitarians is to get those grounds in shape so that we
do not have to immunize. And I believe we are going to do it.

I have said before that it is not altogether a veterinary problem, and we cannot emphasize too greatly the farmers' end of this work, that of better hog-farm management, that of better sanitation of his premises for the eradication of the germ. I believe that we can not in our state work emphasize that side of it too much, and while we are carrying on these researches to make better serum, and to apply our police measures in a better way, the colleges of agriculture in this country have a great work to do in teaching the farmers how to prevent hog cholera; in the application of sanitary measures; how to raise hogs; how to care for those hogs so that they do not get the disease; or how to handle their farm in a way to lessen the danger from infections.

The state live stock boards have an important work to do in the control of the movements of hogs over the state, from one side to another, so as to prevent the transmission of the infection from one part of the state to the other. The United States Bureau of Animal Industry has an important work in preventing the introduction of infection from one state into another. That is well illustrated at the present time in the control of foot-and-mouth disease. If each of these three separate departments will stick to these problems good and strong we will reach the end that we are after much quicker than we are doing now. Each has these large functions to perform, and we ought to co-operate in these things to the end of getting rid of hog cholera. I hope to see the day when the United States Department of Agriculture will prohibit the transmission of virus in bottles from one state to another. We may not be ready for that at the present time because we are in the immunizing stage now, and we must immunize and save hogs wherever we have the disease wide spread. But we ought to turn our faces strongly away from immunization, as strongly as we can, and get to the point of eradication.

If I were in a community where everybody was doing it, I might have to do it myself. But I think it is possible to go into the worst infected community in any state and start a campaign of eradication. Take that county that Dr. Fischer referred to in Ohio, and start there a campaign among the farmers for eradication, and teach those farmers how to do their part in a way so that you would not have to spend $27,000 a year for serum. I am glad to see that Dr. Fischer says that ultimately we will get down to serum alone. I hope that all present will hasten that day, and that we will
go a step beyond that; that some day we will get away even from serum alone, and by better hog-farm management, the teaching of the farmers of the country how to avoid infections; that we will stop the great expense that the farmers are put to now in the purchase of serum and the application of serum.

I can not, in spite of the facts which the doctor had on the screen, help but believe that we do have a spread of hog cholera through too much use of virus. I can not agree with the statement which Dr. Fischer has made in his little bulletin that in the vaccination of a half a million swine they have not been able to trace the spread of infection from any vaccinated animal. The experiences of the farmers of the country and the great cautions that are given by every man that sells serum, show the possibility of this thing. I think it happens every day. The first figures which Dr. Fischer quoted of the large increase in that second year may have come from too much use of this on some farms where they did not have the disease before, for I understand that they were in that stage of our progress in sanitation where they were vaccinating the herds around that were not yet infected. Those of you who were here last year and the year before know that that was the way to do it; that you use serum alone in these infected herds, and you use virus in the herds around, and we thought that by using men who were graduates, men who were thoroughly trained in these matters, and by using serum that was made under Government license, we could control these things, but I do not believe we can. I think it is inherent in the business, that it must spread hog cholera. I do not believe the most expert man in the country can prevent it.

Now I can show you counties in Missouri where we are doing very little vaccinating. There is one county in Missouri where they did a lot of that. There was a man there who was county agent, and that was one of the first jobs that he got, and the first thing he did when he got off the train was to go to a place and do some vaccinating. They had lots of cholera there. Well, we made an anti-hog cholera campaign in that county and we taught those farmers how to get along without serum and how to get along without virus. We brought them back to the principles of control of contagious diseases, which are simple. It means quarantine. It means disinfection, and it means when necessary some serum. But those first two things are the important things. We can not control contagious diseases unless we apply quarantine. We can not control infectious diseases unless we apply disinfection. Those are the big things that
the sanitarians apply. Now it does not make any difference about the machinery by which we do that, if we do it. The man who is close to the hog pen, where the disease is, he is the man that is on the job all the time, and we have got to teach him to apply those right principles of the control of infectious diseases, and we can do it, and we are doing it. These are the things which every state must take up and magnify, rather than the use of hog cholera serum.

If you will take up the slogan of "Simultaneous Sanitation" instead of "Simultaneous Vaccination," you will make progress in this matter in this country. That means the organization of your farmers who are together into groups to do the simple things, to do the simple things that they can do and are willing to do. In Dale County, Missouri, in Johnson County, Missouri, in Cass County, Missouri, and in Bates County, Missouri, we are doing these things. And the people like it. They do not have to buy so much serum.

You cannot do these things in six months or in a year, but you can keep these people at it and show them how they can apply these things in an organized way. It is by organization and the following of right principles, and the use of those things, that we will kill out hog cholera germs. If you can get the man's mind fixed on the point of killing the germs, why you do not have to bother much about it, and the problem is not such a hard one.

We are taught that there are hundreds of ways of spreading the disease; that the birds of the air will take it for long distances. They will. The dog will carry it from one farm to another. The pigeon feeding behind the hogs in my pen will carry it over to my neighbors. They will carry the disease on their feet from one place to another. And there seems to be so many ways in which it is carried that the farmer gets discouraged. He throws up his hands. He says: "How in the world can we ever do it?" The man who has a serum to sell says: "You cannot do it; you have got to immunize," and some men who are state veterinarians believe these things; that it is impossible; that it means an immunization of all the hogs in the state. With four million hogs in Missouri, at not less than a half dollar a head, that means two million dollars to do that. That is in the cost of serum, almost in the cost of serum alone. We have a better way than that, and that is a simple way. So in their experiments I want some of the states to take up these simple ways of doing these things. One or two men in a county is all that is necessary. You don't have to have a half dozen veterinarians and a quarantine line
around, but you want to get groups of counties to do these simple things, and get the farmers themselves busy doing what they ought to do, and they are willing to do it:

We organized clubs for doing this work. I remember one where we had forty members. I put it up to them in this way: "Mr. White, your neighbor is not here today. He thinks I have got some serum to sell. He thinks I am out here boosting serum, and he probably does not want to come, or some other business may have kept him away. He may get the cholera on his place, and you are then in danger, and eight other farms that are around there are in danger. It is the business of the men who are here today to get the rest of the bunch joined up in this work." In two weeks that club of forty members had increased, without any efforts on our part, up to 85. So it shows you that the farmers, when you put up to them something that they can do, something that is going to save them money, something that is going to help up-build the swine industry of this country, they are willing to take it up. And it is not through immunization that we are going to solve these problems.

Now, I am not prejudiced against the use of virus where it is absolutely necessary. In one of these clubs that was formed they picked out a man for president, and he arose and said: "Well, I am using the simultaneous method, and I may have to continue it." I asked him why. "Well," he said, "I am here at the bottom of the stream, and everybody up above there is doing it." "Well," I said, "do you want to continue it?" He said, "No, I don't. But," he said, "everybody up there is doing it, and have been doing it." I said, "If I were in your place I would do it too, but the business of this club, and the business of you fellows is to get these fellows up the creek into the same movement of killing out hog cholera germs. That is the business that you fellows should be in."

Now we do not have to watch but about three things, just about three things. A sick hog that has the disease in his body is one, and the worst spreader of the disease. Every time that sick hog drops some of his dung it is planted where other hogs can get infected. Every time it urinates it has thrown out some germs. Then a farmer is taught to do this: Simply take that first hog and put it into a quarantine pen. Here comes in the quarantine on the part of that man. Shut up that sick pig in a small place where he can disinfect it with a half bushel of lime or a little compound cresol solution or something like that, and not let that pig spread it all over the place. Better farm management, you see. He does not have
to get the state veterinarian to come and quarantine his whole place. He should do it himself.

Next is the dead hog that lies around and from which the buzzards and the crows and the bugs spread the disease all over the country. That man can control that. He can burn up that dead hog.

The third thing is the infected feed lot. From those small feed lots that become badly infected, it is not difficult to clear out the infection, and there is a very simple way by which you can do it. Quicklime will do it. I have tried it in badly infected yards, in stock pens, and have put pigs in stock pens that were badly infected, where hogs had been shipped through and died, and by simply liming those yards properly I have kept pigs in them for three weeks without one of them getting sick.

It is not necessary for the farmer to disinfect a whole forty acre or one-hundred-acre field. In these small places, though, where the infection is great, he can kill that out. He spends ten times more money for serum sometimes than it would take to do that disinfection work, by the spreading of quicklime over those places, over those yards, and letting it lie there a few days, and then raking it up into one place, and putting a little more on and letting it lie there a few days. It will kill out all those hog cholera germs. Not only that, it will kill out the worm eggs in that dung. Not only that, but mixed with that dung it makes a good application to his fields. Many of your lands need sweetening up with a little more lime. Even if you do not have a bit of hog cholera on your farm, the use of that lime in a proper way is a good farm procedure. Better farm management, gentlemen, is the big thing for the control of these contagious diseases.

Then, when it comes to serum, use serum alone. We have found out in these counties where we are doing this work, that we do not have to use virus, and we do not have to have a large number of men in order to do effective work. If you get the co-operation of these farmers, and make sanitarians and better farmers out of them, your work will be greatly lightened. That is the business that the agricultural college has before it, the big task. More and more of that sanitary work must be carried on. So I hope the day will come when we will get into the position that Canada is in. You cannot ship a hog to Canada if the disease is within five miles of your farm. You know that the Canadians will not take your hog if he has been injected with serum alone, and he is wise, because that means that there is disease around pretty close
there, if that man is using even serum alone. They prohibit you from sending in hogs that have been vaccinated by the simultaneous method. They prohibit you from sending virus or even serum into their country, and they are right, because there are dangers in those things, even in serum alone; even in the serum that is drawn from the neck of hogs, there is danger. That sometimes has infection in it, because those hogs are sometimes killed just a little too soon, and there may be virus in the serum that is sent out. Sometimes you will see speckled kidneys in that hog. I do not like to use that kind of serum. So let us get away from virus, and do these things that help eradicate hog cholera. (Applause.)

Dr. Graham: Mr. Chairman, our problem of hog cholera eradication in Kentucky is comparatively small. We follow the steps of the other states. We look to the Bureau of Animal Industry for information and direction. We apply those directions. I have a paper which gives our experiences in their application.

ANTI-HOG-CHOLERA SERUM PRODUCTION IN KENTUCKY.
Robert Graham, Lexington, Kentucky.

Anti-hog cholera serum is one of the most difficult biological products to prepare. In reviewing the production of serum from the beginning, we can not fail to note the improvement in the general technique. The fundamentals of production have not materially changed, but the details of each step have been perfected as well as regulated by law to insure a potent serum. There are many details which must be carefully executed in order to secure a uniform product which time has perfected, and I believe the anti-hog cholera serum which is being marketed at present is far superior to the serum available in past years. A potent serum in inexperienced hands, however, may be ineffective, and the problem of administration of anti-hog cholera serum at this time in Kentucky is of far more importance than production.

The outbreak of foot-and-mouth disease is a decided drawback to the production of anti-hog-cholera serum, as it increases the details and necessary precautions to be employed. It requires the careful testing of the serum and virus for this infection, in addition to every precaution in the purchasing of animals for serum production, inasmuch as the lesions of foot-and-mouth disease in swine can not always be detected on physical examination, especially in the incubation stage of the disease. Foot-and-mouth infection might be carried on shoes and clothing by visiting farmers. There are endless ways in which it might gain entrance, and it behooves all producers of anti-hog-cholera serum to employ precautionary measures against the possible introduction of this infection until it has been completely eradicated.

The routine methods of producing anti-hog-cholera serum, i.e., quick subcutaneous or intramuscular, slow subcutaneous or intramuscular, intraperitoneal and intravenous, all serve their purpose, and different laboratories have their preferences. The conclusions reached by some seem to favor the intravenous method, though the results from
any method no doubt depend in a large measure upon the skill of the individual in manipulating same. We object to abscesses in serum-producing hogs, and for this reason the intramuscular or subcutaneous method has not proven satisfactory in Kentucky. From our experience, the method properly employed does not markedly influence the potency of the serum, other things being equal. The intravenous method is used almost exclusively by the Kentucky Experiment Station.

We draw serum from the tail of hyperimmune animals from one to four times at seven to ten-day intervals. The one carotid bleeding method, I understand, has been adopted in some laboratories exclusively. The inference is that the serum is more potent, but no doubt this method is used in a measure as a "commercial adjunct." Our experience along this line is suggestive that one carotid bleeding does not produce a more potent serum. It is an established fact that the first four tail bleedings properly mixed will come up to the standard. Even a fifth tail bleeding might be taken without materially lowering the protective value of the serum if mixed with the previous drawings.

The potency of serum is variable, and this brings up the question of individual ability of hyperimmune hogs to produce the theoretical anti-bodies, but in this connection there is no practical method of previously ascertaining this quality. Some hyperimmunes produce a serum of much higher potency than others. We can eliminate the non-producing hyperimmunes in some cases by physical examinations and by keeping records of the body weights of the animals. If hyperimmune animals do not gain in body weight from week to week, we discard them as suspicious, and if no improvement is noted, they are permanently released. We regard the body weights and temperatures of hyperimmune animals as a criterion which can not be safely overlooked.

The amount of virus introduced intravenously to properly hyperimmunize an immune animal is not uniformly accepted by all serum laboratories. We have injected from four to eight cubic centimeters per pound body weight. Our results, taken all in all, indicate that the amount recommended by the Bureau of Animal Industry, i. e., five cubic centimeters per pound weight, is sufficient. We also employ this amount in re-hyperimmunizing. The mortality from shock and edema of lungs is not as frequent as when larger doses are used.

Considerable loss during the warm months of the year has been experienced in hyperimmunizing. Stimulants have been used to control the cardiac and respiratory functions with negative results. During the year 1914 eight hundred and sixty-four immunes were hyperimmunized intravenously with a mortality of ninety-one animals. This included losses from over-bleeding which happen more than occasionally in the warm weather. The mortality in all was 10 per cent plus. Our losses were immediately reduced by following the suggestion of Dr. W. B. Niles, i. e., to occasionally filter the virus to remove the B. cholera suis and other secondary micro-organisms before inoculating susceptible pigs for virus production. This, I believe, reduced the mortality to about 2 per cent. The secondary micro-organisms in hog cholera blood can also be reduced by carbolizing the virus for a few days in a 2 per cent solution. The loss following hyperimmunizing is one of the most interesting studies in serum production, and possibly involves problems in anaphylaxis. At times the explanation of sudden fatalities is most perplexing. We have adopted the plan of releasing immediately any animals showing serious respiratory disturbances.
These animals are then injected in from two to ten days, and in most instances with good results.

Occasionally in the production of virus blood we have noticed animals apparently in the desired stage of the disease whose blood would re-clot despite the attempt of defibrinating and straining. The exact cause of this we have not been able to ascertain. Whether it is of bacterial or chemical origin, possibly some have concluded.

Temperature of Serum Storage.

The temperature best suited for preserving serum is approximately 40 degrees F. Instructions to this effect are given to the men in charge of the serum depots throughout the State of Kentucky. In summer all serum shipped is packed in ice. We regard the temperature at which serum is kept as a very important item, and in some instances it seems that too warm a temperature might influence the effect of the serum when injected. Many samples of impotent hog cholera sera can be detected by physical examination. In return serum, if it is discolored, we feel assured that it is not fit for use. Serum that becomes a lighter shade in color and of a thinner consistency is dangerous. This is evidence that the serum is deteriorating. Serum may undergo this change in a period of a week or ten days. A serum that gives a slight phenol odor, and that is very dark in color, seems to withstand test for potency better than others.

Serum Depots.

In order that swine breeders may have serum available on short notice, serum depots have been established in ten different counties in the state, in charge of competent men. These various depots provide immediate service to the swine breeders, and in emergency cases permit the serum to be had at a moment's notice. The results of this expansion have been very effective, and serum depots will be established in every hog raising county in Kentucky as the situation warrants.

Bacterial Examination of Anti-Hog-Cholera Serum.

The various serial numbers of serum manufactured are examined bacteriologically to determine the extent of contamination. Following is the technique employed by our Mr. E. J. Gott in making bacteriological examinations of serum. After shaking the bottle containing the serum vigorously for two minutes, one cubic centimeter of the serum is withdrawn, using a sterile pipette, and introduced into a sterile test tube containing nine cubic centimeters of sterile water, thus making a dilution of 1 to 10. This first dilution is again shaken vigorously for one minute in order to break up all clumps of bacteria and to make a homogenous mixture, of which one cubic centimeter is taken with a sterile pipette and introduced into a sterile tube of nine cubic centimeters of sterile water, thus making a final dilution of 1 to 100. This last dilution is then shaken for one minute, one cubic centimeter withdrawn and introduced into a sterile Petri dish. A tube of sterile melted nutrient agar, 1 per cent, reaction neutral (six to eight centimeters in tube), is well cooled to 38 to 42 degrees centigrade and poured into the Petri dish. The dish containing dilution and agar is then rotated for one-half minute in order to thoroughly mix the two solutions therein. After the agar has solidified, the Petri dish is incubated at 37 degrees centigrade for forty-eight hours, at the end of which time the colonies of bacteria appearing in the Petri dish are counted and the number
multiplied by 100, the dilution, thus giving the total number of bacteria per cubic centimeter. It is unnecessary to state that all glassware, dilution blanks, etc., are sterile. The cotton plugs are first burned over a flame before opening the tubes, etc., and after withdrawing the plugs the mouths or openings of such glassware are held over a flame before introducing the pipettes and in the case of the agar tube before the agar is poured into the dish. In our experience some sera produced contained no bacteria, others ranging upward to as high as 65,000 per cubic centimeter. In this connection it can be said that no relation between bacteriological content and potency could be noted. Serum that showed the presence of secondary bacteria proved just as potent as the sera which were sterile. However, the bacterial content of serum is important, as no doubt serum which contains large numbers of bacteria might produce pyemia or septic infection. The determination of secondary bacteria in serum should be adopted as a requirement in the routine of production. The samples for bacteriological examination are taken from the mixing tank at the time a sample for potency is drawn. The potency sample is drawn subsequent to stirring and mixing.

Results of the Use of Anti-Hog-Cholera Serum in Kentucky by the Kentucky Agricultural Experiment Station During the Year 1914.

Total number herds treated .............. 1,478
Total number hogs treated ............... 57,297
Total number hogs suspicious .......... 12,414
Total number hogs reported .......... 52,265
Total number hogs not reported ....... 5,032
Total number herds reported ......... 1,339
Total number herds not reported ...... 139
Total number hogs lived ............... 47,815 .91.49 per cent
Total number hogs died from all causes ... 4,450 .8.51 per cent

Dr. Fitzgerald: Mr. President, I do not know as I can say anything this evening that will add any more to that which has already been said. I will state frankly that my experience is rather more that of the laboratory than a field experience, though I have kept in rather close touch with field work. It is a well known fact to all of you here, that Ohio has always been a strong advocate of the simultaneous method of treatment, and we are still using it there. We see no reason why we should discard it.

I strongly concur in what Dr. Connaway has said in regard to training the farmer to be a thorough sanitarian. But I find we can not make veterinarians out of all our farmers, it is difficult even to make sanitarians out of most of them, and we have to supervise a great deal of his effort along sanitary lines. You have to keep in pretty close touch with him if you are to get results. You can take his word for it if you wish, but I would rather go and see for myself what he has done.

It is difficult to get good, effective, thorough work. We are finding that out every day in the foot-and-mouth disease
campaign. It is remarkable, it is wonderful that we are getting the results that we are getting when we consider some of the efforts that are made, and we must have uniform, systematic attacks on any of these diseases.

I was very greatly interested in Dr. Haslam's paper. I do not know that it is necessary to touch upon that. There were a few points that I wanted to speak of, one of them is with regard to the large dosage of serum in his tests, where he went beyond the usual field dose, giving from one to two and a half, and up to five c.c. per pound weight, and getting the average day's high temperature in individual cases in those tests. I find in my work that you can take a normal, healthy pig and take his temperature for forty days, whether he has been treated or not, and you will find that he will average two days with a temperature above 104, or more than that, probably, depending upon the conditions under which he is kept.

I was very greatly interested in Dr. Reichel's paper. I have a copy of that chart in my pocket now, and I am going home, and we will see whether he is telling the truth or not. Dr. Reichel and I have fought a lot of these things back and forth, and he is checking me right along, and I am camping on his trail. But it is a friendly competition, isn't it, doctor? We haven't got our knives out for each other as yet. In the same way I am watching every man in the United States who is working along this line. It is a great pleasure to come here and get inspirations, and feel that when you get back, with your almost insurmountable difficulties that you have at home, you will know that they are, no greater than those which the other fellow is trying to surmount. I think that the possibilities in the problem of hog cholera serum, and in the control of this disease, are greater than any of us as yet appreciate. We are just at the beginning of the control of this disease. (Applause.)

Dr. Kigin: While we are discussing the subject of serum alone and the simultaneous method, I would like to speak a few words relative to an experiment that we have been carrying on in Nebraska. In the western part of the state we have three counties under irrigation. Until a year ago the past fall there never had been hog cholera in that section of the state. There was a man who shipped some hogs from one of the eastern counties out into the western section, and introduced hog cholera there. They wrote in and asked what could be done with the hogs; if they could destroy them and pay the man and wipe the thing out, but at that time the Board was
new, and they did not know what action to take, and they did not take any action. The result was that hog cholera began to spread in that section, and in that irrigated section in particular it spread very rapidly. However, they were very fortunate not to have a virulent form; it seemed to be rather a chronic form. The hogs would get sick and linger along, and die very slowly.

Last winter I went out over that ground and made a survey to determine what would be the best means of eliminating hog cholera from that district. I came back and laid the matter before the Board, after talking to a banker who is one of the most active men in this district, and who I knew had a great deal of influence in the four counties. I suggested that we quarantine four and a half counties, involving the three counties under irrigation, and two other counties, as it would give us a kind of check on the dry land there, and more proof as to what could be done. For they could say: "Well, it spread down through those irrigation ditches." I laid the matter before the Board suggesting that we quarantine the four and one half counties, which we did. We started in and forbade the use of virus in that section.

This spring the Animal Husbandry Department sent a man out there to promote the hog industry, and we found that he had a greater problem confronting him, and that was to eradicate hog cholera; in fact the farmers would talk to him about nothing else than the eradication of hog cholera. They did not want it to come in there, and they knew that if it got in and ever got a start in that irrigated district it would absolutely clean them up. He knew quite a bit about vaccination and went out over those counties and lectured as to the value of sanitation, and as to why we did not want to send virus out there. He said that we were almost all using virus, and that we had no control over those who use it, and by the indiscriminate use we feared that we would have a more virulent form of the disease.

After this man from the Animal Husbandry Department, Mr. Jones, went back there and started his work, I sent a deputy to assist him, and they worked constantly in that section. I believe it was 102 herds which they treated, and there were some 14 herds that came down with the disease six weeks or two months after they were treated. I want to say to you men that there never were men in the world, absolutely there could not have been, that were more sanitary. If I should have gone to one of those farms, or if Mr. Jones, or my deputy should, and said to those men: "Plow up this yard
and cover it with lime before you plow it, and then recover it with lime, and put your hogs over in another pen, and reconstruct everything;” they would do exactly as we told them. At this banker’s place we had kind of a Bureau of Information, and these farmers would string in there by the wholesale to get advice as to what to do. We did not enforce these strict sanitary measures, but we asked them to. We laid before them what it would mean if they did not. The other people around there would bring such pressure to bear, that without any hesitancy they would absolutely pour gallons, and often barrels of disinfectant out on their farms. I know that a number of men did that.

Even on some of those farms that were not in the irrigated district, in spite of all precautions, in spite of everything done in the way of sanitation, the herds would break. If it had been only in the irrigated district I would have felt that it was owing to the water running from one farm to another and disseminating the infection. But this occurred in herds where the farmers had been very particular about disinfecting; they had plowed up the ground around the old hog sheds and burned up the troughs, they had burned up everything. The litter was raked up, and everything was done to make conditions absolutely sanitary, and they felt very much discouraged, so they really rebelled; they said they would not continue disinfection, and they must have virus sent in there in order to control that disease.

I made another trip in that section and talked to a number of those men personally, and told them that I felt that they would be doing themselves an injustice and also an injustice to the community if they insisted upon that; that it was discouraging, but if they would help us and keep up the fight, that in time we would be able to eradicate the disease throughout. They later rebelled again, and I corralled them the second time, and I kept them from absolutely demanding that we send virus there so that they could control the disease.

I thought of adopting this system of making a quarantine pen, like that Dr. Connaway spoke of, built on one side of the farm, and possibly divided up into two or three sections, where all the hogs would be put. If there were any sick ones we would put them into a separate pen, use the simultaneous treatment, and bank around that pen which contained the sick hogs, so there would be no chance of infection running out. I intended further—I do not know but that it would be really impracticable—but I felt that the disease was so scarce, taking the area as a whole, that we would require boards to be laid
four feet high around the pen, so built that there would be no infection thrown out through the cracks in the boards, and over that a very close woven wire which would prevent pigeons or crows or what-not from carrying any of this infection out over that area.

Now I believe that if we are going to resort to sanitation we must have the co-operation of the farmers. This is a very big proposition and one that in Nebraska, I do not believe, has worked as well as it has in Missouri. However, I think that the people of Nebraska are as willing to co-operate when they see that we are trying to work to their interest, as are any other group of farmers. I believe that that is a method that can be adopted successfully.

Dr. Gibson: There is a general movement on foot in the United States, as doubtless many of you know, to get proper legislation for the control of dogs. Bills are being drafted by committees of the National Breeders' Association. Those bills are being introduced into the various state legislatures. I believe it will be a great thing if we get proper control of dogs, and we will have gained some very valuable ground in sanitation, and I would like to suggest that the gentlemen here from the various states use their influence to help pass this bill, which is very complete, very thorough, in the control of dogs.

I was very much interested in Dr. Reichel's paper, and I do hope, as time goes on, the doctor will be able to demonstrate beyond any doubt that this hog cholera serum can be concentrated as he says, and reduced to a proper hypodermic product. I have always felt that it would be a great advance step if we could have such a serum that was as potent and as good as the serum that is now marketed.

Dr. Mack: In speaking of the control of serum laboratories, Dr. Dorset used the term "contaminated serum," and referred to the exclusion of some of that serum from the market. May I ask him to define "contaminated serum," or to state what the standard of bacterial contamination is; how much contamination is allowed? Is much serum found free from bacteria?

Dr. Dorset: Mr. President, the word "contaminated" is a part of the law that covers these serum factories. I did not draw the law, nor did I have any voice in its passage, therefore I can only give my own idea of what the word "contaminated" means in the law. My idea of the word "contaminated," as it appears there, is that it means anything in the serum which causes that serum to produce harm in the
injected animal. I do not care what it is. Anything in the serum that causes the production of disease or injury, abscesses or otherwise, to the injected animal. That is my judgment. We have established no bacteriological standard for serum up to the present time. It may be that we will do that.
EVENING SESSION, FEBRUARY SEVENTEENTH,
8 P. M.

JOINT MEETING WITH THE CHICAGO MEDICAL SOCIETY.

THE METABOLISM OF THE TUBERCLE BACILLUS.
Arthur I. Kendall, Northwestern University.
[A copy of this paper was not supplied to the Publication Committee. See Bulletin of the Chicago Medical Society, vol. 14, No. 25.]

CANCER OF THE BREAST.
W. L. Rodman, President-Elect American Medical Association.
[A copy of this paper was not supplied to the Publication Committee. See Bulletin of the Chicago Medical Society, vol. 14, No. 25.]

INSECTS AS CARRIERS OF DISEASE.
D. K. McMillan, University of Illinois.
[A copy of this paper was not supplied to the Publication Committee. See Bulletin of the Chicago Medical Society, vol. 14, No. 25.]

TRICHINOSIS.
B. H. Ransom, Washington, D. C.

The Parasite.

Trichinella spiralis is a nematode parasite which lives during its adult stage in the small intestine of various mammals; its young become encysted in the voluntary muscles of the same animal which harbors the adult. The adult male is about 1.5 mm. long and 0.04 mm. thick, the adult female 3 to 4 mm. long and 0.06 mm. thick. The most important hosts are the hog, rat, and man to the latter of which the parasite is transmitted by the ingestion of pork containing the encysted stage. Hogs become infested as a result of devouring the carcasses of other hogs, offal from slaughter houses, garbage containing pork scraps, etc., and infested rats. Rats become infested in a similar manner. Just how important rats are in maintaining trichinosis in a given locality is uncertain. Some writers maintain that if the disease is eradicated from hogs no attention need be given to rats as carriers of the parasite, whereas other writers insist that rats are highly important as sources of infection to hogs, and that the parasite would continue to maintain itself among rats alone in the entire absence of hogs. The possibility of the propagation of trichinae through the ingestion of feces from trichinosed animals is perhaps still of theoretical interest but seems quite certainly to be of no practical importance. All available evidence tends to prove that infection from this source does not occur. On the contrary it may be considered an established fact that Trichinella spiralis is transmitted from host to host solely as the result of one host devouring the flesh of another. Trichinae may develop to the adult stage in the intestine of various species of birds but the young produced do not become encysted in the muscles and soon pass out of the intestine in the feces.
The encysted larval trichinae when taken into the stomach of a
man, rat, or other animal are freed from their cysts by the action of
the gastric juice, and then pass to the upper part of the small intestine
where they take refuge among the villi and folds of the mucosa and
become sexually mature in two or three days. Meanwhile they in-
crease slightly in size, and mating occurs, after which the females
rapidly attain their full growth, and penetrate more or less deeply
into the mucosa of the intestine so that they commonly reach the lymph
spaces of the villi. Sometimes, it has been stated, they entirely pene-
trate the intestinal wall and may be found in the mesenteries. Adult
trichinae of both sexes have been found in the intestine as late as 12
weeks after infection and the females usually live for several weeks.
Intestinal trichinae may commonly be found in large numbers as late
as 7 weeks after infection. The adult trichinae, however, are essen-
tially short lived and die when their reproductive function has been
fulfilled. Most of the males die and pass out of the intestine soon
after mating. The young of Trichinella hatch from the egg within the
uterus of the female and are born as free embryos. Birth begins 4
or 5 days after the mating of the sexes, that is, at the earliest 6 to 7
days after the ingestion of the infested meat. Undoubtedly not less
than 1,000 young, perhaps several thousand, may be produced by a
single female. The production of young continues during several weeks,
but many more larvae are born during the first two weeks after in-
fec tion than subsequently.

The larvae, about 0.1 mm. long by 0.006 mm. thick, are deposited
by the female trichina directly into the lymph spaces, through the
vaginal aperture which is located near the anterior end of the body.
Newly born trichinae are sometimes found also in the lumen of the
intestine, but it is doubtful whether these succeed in reaching the
musculature of the host. The larvae pass from the intestinal wall
with the lymph into the thoracic duct, into the venous system, and
then into the heart from which they are carried finally by the circula-
tion into the peripheral arterial system. They may be found in large
numbers in the circulating blood, and as determined by Stäubli are
most numerous between the 8th and 25th day after infection. Those
larvae which are carried to voluntary muscles leave the capillaries
and remaining only a short time in the connective tissue quickly pen-
etrate into the primary muscle bundles. The behavior of the larvac
at this point is probably governed by chemotactic influences, perhaps
also there are mechanical reasons for the entrance of the parasites
into the striated muscles and into certain muscles in preference to
others. As various authors have observed, it is the most active mus-
cles and those with the richest blood supply which are a rule the
most frequently and most heavily parasitized, such as the diaphragm,
intercostal, laryngeal, tongue and eye muscles. It is of interest, as
noted by Stäubli, that it is these muscles which are especially rich
in oxygen. The period of the greatest invasion of the muscle is the
ninth and tenth day after infection.

The larva after penetrating into the muscle fiber grows rapidly;
at first principally in thickness, then also greatly increases in length.
Within 10 to 14 days it reaches a length of about 1 mm., ten times
its original size. It then rolls itself into the characteristic spiral form
of the encysted parasite.
degeneration. There is a multiplication and enlargement of the nuclei, the transverse striations disappear, and then the fibers take on a granular appearance through simple fatty degeneration. An invaded muscle fiber in the neighborhood of the spirally rolled but not yet encysted trichina is seen to be swollen into a spindle form and the sarcolemma is thickened and glassy in appearance. The neighboring fibers are also affected as well as the intermuscular connective tissue which undergoes marked proliferation in the vicinity of affected fibers. As the latter become gradually absorbed a capsule is formed around the parasite.

According to Graham the capsule is formed in part from wandering connective tissue cells which penetrate into the degenerated muscle fiber and begin the capsule formation at the poles of the spindle, and in part from connective tissue elements deposited along the sides of the spindle. The form of the capsule varies somewhat from nearly round to elongate-oval, commonly lemon-shaped. The round form is especially common in the rat, the elongate form in man and the hog. The average size is about $\frac{3}{4}$ mm. in length by $\frac{1}{4}$ mm. in breadth. Usually only one trichina is found in each capsule, sometimes two, more rarely a larger number.

Capsule formation begins in about a month after infection, and the very thin capsule is quite evident five to six weeks after infection, becoming completely developed between the seventh and ninth week. The fully formed capsule is sharply contoured, homogeneous in appearance, transparent, staining only slightly in hematoxylin. Sooner or later fat globules accumulate in circumscribed masses at the poles of the capsule. In six months, at the earliest, calcification of the capsule begins, first at the poles, and is completed at the earliest one and a half years after infection. The parasites may remain alive for years in calcified capsules, as long as thirty-one years according to Langerhans. Sooner or later, however, if the host remains alive, the parasites die and are absorbed or become themselves calcified and break down into crumbled masses.

It should be noted that trichinae never complete their larval development or become encysted in any other tissue than muscle tissue, and only in the voluntary cross-striated muscles. Wandering trichinae may be found among the muscle cells of the heart, but do not develop further or become encysted in this organ.

Encysted trichinae differ from other larval nematodes in the fact that they show a distinct sexual differentiation into males and females. The reproductive organs are already considerably developed and the encysted trichina is therefore in a stage of development corresponding to the nymphal stage of insects rather than in a larval stage, although the term nymph in zoological terminology is not applied to worms. It is of course because of this advanced stage of development that trichinae become so quickly mature after ingestion by the host.

**Etiology.**

As already noted, trichinosis in man results from eating pork containing the encysted stage of the parasite. One physician a few years ago recorded a case of supposed trichinosis in himself which he attributed to an accidental infection acquired while performing an autopsy. Ordinarily, however, no physician while performing an autopsy is at all likely to swallow sufficient muscle tissue from a
cadaver to produce appreciable symptoms of trichinosis no matter how heavily infested the subject may be, so the chances of trichinosis from such a source must be considered extremely remote, and it is safe to assert that in this particular case the real source of the trichinosis, if the diagnosis was correct, was quite different from that suggested by the physician. Jackson in 1867 traced certain cases of trichinosis to beef from cattle fattened in distillery stables on Long Island, and in fact reported the beef as infested with trichinae. There is a possibility of beef being infested under rare circumstances; for instance, if cattle should be fed garbage containing raw pork scraps infection might result if some of the pork happened to be infested, though as a matter of fact it is very difficult to infest cattle even when deliberate attempts are made by feeding infested meat as may be done for experimental purposes. Excepting Jackson's cases and the doubtful case of the physician, all recorded American cases, so far as traced, have had their origin from pork. Rats which are commonly infested, dogs which are rarely infested, and various carnivorous animals other than hogs, are not known to have been the direct cause of any cases of human trichinosis in this country. Except under the most exceptional circumstances it must be assumed that any given case of trichinosis in man had its origin in infested pork eaten raw or, in view of the rather low thermal death point of trichinae, very imperfectly cooked.

Course of the Disease.

Unlike many other infectious diseases, the severity of an attack of trichinosis depends necessarily upon the number of parasites ingested. Large quantities of pork must be eaten if slightly infested in order to produce appreciable effects, or the pork must have been heavily infested if severe trichinosis follows the ingestion of small amounts of the meat.

In severe cases of trichinosis three stages in the course of the disease may commonly be distinguished, but as these stages are not at all clear in light and sporadic cases, which are undoubtedly most common in this country, and as diagnosis is only difficult in such cases, the distinction of the three stages seems to be of little practical importance. In fact an important characteristic of trichinosis, whether mild or severe, is the lack of regularity in its course. The first stage, known classically as the stage of ingestion, corresponds to the development of the adult trichinae in the intestine and the production of their young, and is characterized particularly by gastrointestinal symptoms. The first symptoms may become apparent within a few hours after ingestion of the infested pork or on the following day. Nausea, vomiting, diarrhea, abdominal pains, are common symptoms, but may be lacking. Except in very light cases a sort of general torpor is noticeable, accompanied by weakness, muscular twitching, and sensations of tension and pain in the muscles, especially the flexors of the limbs. Toward the close of the first period, that is, in about a week, edema of the eyelids and face appears and this is frequently the first striking symptom to be observed. The puffiness of the face is likely to disappear in a few days, but reappears a few weeks later. It is important to note that the gravity of the case can not be judged from the severity of the first symptoms. In some of the worst cases the first symptoms are very mild.

The second stage, that of digression, is associated with the dis-
tribution of the larval trichinae throughout the body and their penetration into the muscles. The symptoms characteristic of this stage appear nine or ten days, sometimes not before two weeks, after infestation, very exceptionally at a later time. Severe muscular pains, especially in the flexors, sometimes extremely severe so that a posture suggestive of general articular rheumatism may be assumed, are especially characteristic. The muscles become swollen, tense, and hard. Movement of the eyes is likely to be painful. The conjunctiva is inflamed or ecchymotic. Associated with the invasion of the muscles of mastication, tongue, pharyngeal and laryngeal muscles, are disturbances in the functions of those muscles. The invasion of the muscles of respiration causes more or less severe respiratory troubles early in the course of the disease. These troubles later become aggravated particularly in the fourth and fifth weeks in the form of pronounced dyspnea and violent attacks of asthma sometimes so severe that they terminate fatally. Profuse sweating is very common during the second period, but may last throughout the attack.

The third period, that of regression, beginning some six weeks after infestation, follows the encystment of the parasites, and is ushered in by an exaggeration of the symptoms of the second stage and the appearance of new symptoms. The legs and forearms become edematous, likewise the abdominal walls, and the face is greatly swollen. The myositis characteristic of the second period gradually subsides. The patient becomes extremely anemic. Various cutaneous eruptions may occur. The edema is often followed by extensive desquamation. Pneumonia is liable to be a complication in the third stage.

Fever usually occurs beginning in the first period and is especially marked during the second period. Its height is attained about ten days after the first symptoms and may reach 104 degrees or higher in severe cases. It may be continuous as in typhoid, or show well-marked daily remissions. Sometimes there are long periods in which fever is absent, broken by sudden rises in temperature. Temperature disturbances may continue two or three weeks in mild cases, or five or six weeks in more severe attacks. Fever is commonly absent in children. Mental disturbances are frequent except in mild cases, and even in such cases the patient is likely to be very apathetic and indifferent to his surroundings. Insomnia is the rule, except in grave cases with very high temperatures, when somnolence and delirium add to the resemblance to typhoid.

**Prognosis.**

The duration of the disease and the prognosis are uncertain. In some mild cases the patients do not become bed ridden, show no fever, and recover in two or three weeks. Death occurs most frequently during the fourth to the sixth week when the myositis is at its height; it rarely occurs before the end of the second week or after the seventh. Recovery in the most typical cases does not occur within less than five or six weeks after infestation, and sometimes is not established for several months. Muscular strength returns slowly and a tendency toward recurrent muscular pains may persist a long time after apparently complete recovery. Sometimes weakness continues for many years. Commonly the cases in which a copious diarrhea appears early in the disease are of short duration and mild in type.
Young children are likely to recover quickly, and rarely die, whether because of the smaller quantities of pork ingested or because of their particular susceptibility to diarrhea, which perhaps tends to reduce the severity of infestation by eliminating many of the intestinal trichinae, is uncertain.

**Diagnosis.**

Pronounced leucocytosis is the rule in trichinosis, an important diagnostic point in distinguishing it from typhoid. Eosinophilia, as first noted by Brown and Thayer in 1897, is also almost always present and begins at the time of migration of the larvae. The number of eosinophils is commonly as high as 30 per cent, but has been found as high as 86 per cent.

Stäubli has recently shown, however, that eosinophilia is not, as commonly stated, invariably present in trichinosis. It may be absent, particularly in cases of heavy infestation, and in cases complicated by bacterial infection. More or less pronounced eosinophilia, according to Stäubli, may be present months and even years after an attack of trichinosis. Certain cases of chronic rheumatism have shown a definite eosinophilia, and this has led to the discovery of old encysted trichinae in excised pieces of muscle, which gives rise to the suspicion that many cases of so-called rheumatism are really chronic trichinosis.

Summarizing the diagnosis of trichinosis it may first be noted that though it is easily recognized when it occurs in epidemic form, the occurrence of so many sporadic cases and their variable symptomatology make it ordinarily a difficult disease to diagnose. Thompson (1910), who has made a study of fifty-two sporadic cases, emphasizes the following characteristics:

1. Acute onset, usually with vomiting and abdominal cramps.
2. High grade of eosinophilia usually above 30 per cent, frequently much higher.
3. High grade of temperature often reaching 104 degrees or more and lasting in lessening degree for two to six weeks.
4. Edema of eyelids and face with pains in the eyes in about 25 per cent of cases.
5. Dyspnea and diaphragmatic breathing without cyanosis in about 25 per cent of cases.
7. The sudden onset of symmetrical circumscribed corneal hemorrhages in a patient whose blood vessels are not degenerate should give rise to a suspicion of trichinosis.

**Treatment.**

The treatment of trichinosis is entirely symptomatic. The patients are generally not seen until it is too late to benefit the patient by the administration of anthelmintics and cathartics. Attempts to expel the parasites from the intestines by such means probably do more harm than good, except perhaps in the very earliest stages within a few hours or a day or two at most after the ingestion of the infested pork.

**Toxicology.**

The chemico-toxicological side of the subject of trichinosis is of great interest. Ehrhardt in 1896 expressed the opinion that the degeneration changes in trichinosed muscles were caused by toxins pro-
duced by the parasites, a view which was shared by Metschnikoff (1901). Various authors would explain the mental symptoms, delirium, facial edema, fever, etc., as caused by toxins. Staubli found evidences of the presence of a poison in the early stages of trichinosis which in rats at least has an extremely toxic effect on the blood.

Romanovitch (1912) concluded from experiments that the blood serum of trichinous animals is more or less toxic when injected into experimental animals. Hoyberg (1907), however, got no toxic effects from the injection of blood serum of trichinous animals. Gastel (1914) also failed to get any toxic effects from the injection of blood serum of very heavily infected animals.

Flury (1913) as a result of extensive investigation and experiments in the chemico-toxicology of trichinosis came to some very interesting conclusions. He found that the chemical composition of trichinosed muscle undergoes great changes. The glycogen becomes greatly diminished and may almost disappear; this is correlated with the high glycogen content of the trichinae. The creatin and purin bases as well as the total nitrogen are at first reduced in amount, whereas the water, extractives, ammonia, volatile acids and lactic acid are increased. Later there may be large local accumulations of creatin and purin substances. The locally irritating substances in addition to decomposition products of the muscle degeneration are notably volatile acids, and these substances are considered by Flury responsible for the severe pains of trichinosis. Purin bases appear to be responsible for the hard infiltration of the muscles in trichinosis; whereas other basic substances of curarin-like properties are responsible for the nervous symptoms. The edema of trichinosis probably traces back to certain nucleo-proteid-like substances taken up by the blood from the modified trichinous muscles. Colloidal substances of indefinite character and certain purin substances appear to play a part in producing the fever of trichinosis. The subcutaneous or intravenous injection of a heat-resistant capillary poison present in trichinosed muscle produces in experimental animals through injuries of the capillaries, hyperemia and hemorrhages in the alimentary canal, lungs, and liver, and acute pulmonary edema; and this poison is to be considered responsible for the hemorrhages frequently noted in the literature of trichinosis, and commonly attributed to ruptures, emboli, or occlusion of the blood vessels by trichinae. With reference to the location of trichinae in voluntary muscles, Flury makes the interesting comment that inasmuch as the parasites have such a high glycogen content they require nourishment rich in carbohydrates and therefore find especially favorable conditions in the muscles, which undoubtedly has more to do with their location there than purely mechanical stoppage by the finer capillaries so frequently advanced as an explanation.

Prevalence of Human Trichinosis.

At the present time, as in the case of many diseases, so little is known of the prevalence of human trichinosis in the United States that it is impossible to state its prevalence in accurate mathematical terms. Cases occur, it is safe to say, that do not receive medical attention, other cases, it is quite certain, are not recognized as trichinosis by attending physicians, and many cases correctly diagnosed are not recorded in medical literature. Furthermore, systematic microscopic examination for trichinae is only very exceptionally carried out at
autopsies, consequently very few statistics on the prevalence of trichinosis are available from this source.

An examination of the literature shows, however, that trichinosis is by no means an unusual disease in the United States. It has been reported from thirty states. Since 1842, when Bowditch and Jackson reported finding trichinae in the muscles of a man who had suffered with rheumatic pains in the legs and arms, at which time of course the pathological significance of these parasites had not yet been recognized, about 1,550 cases have been recorded in the United States, 240 of which were fatal, or about 16 per cent. It should be noted, however, that as fatal cases are more likely to be reported than those which recover and as mild cases may not even come under a physician's care, the actual lethality of human trichinosis is probably much less than 16 per cent. If the reported cases which have occurred during the last five years, 1909-1914, are alone considered, it is found that in a total of about 320 cases, there were nineteen deaths, or about 6 per cent. The State of New York leads in the number of cases, about 250 with 62 deaths, followed by Pennsylvania, about 260 cases with 16 deaths; then comes Massachusetts, about 145 cases with 13 to 15 deaths; then Minnesota, about 100 cases with 12 or 13 deaths, and California, about 91 cases with 9 deaths. Illinois has had about 90 cases with 24 deaths, or if certain rather indefinitely reported cases are included, the total number of reported cases for Illinois may be given as 150 to 160, which would place Illinois third among the states arranged in the order of the number of reported cases of trichinosis. Only one case each has been reported from Louisiana, North Carolina, and the District of Columbia, the last a fatal case. In the other twenty-four states the number of cases ranged from 1 to 75, and the number of deaths from none to 21.

Owing to errors which have undoubtedly crept into the compilation, as well as to those resulting from faulty case reports the following tabulation of cases of trichinosis in the United States can be considered only approximately correct. Cases reported in letters from correspondents are included in addition to those published in the literature:

<table>
<thead>
<tr>
<th>State</th>
<th>Cases</th>
<th>Deaths</th>
<th>State</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>91</td>
<td>9</td>
<td>New York</td>
<td>355</td>
<td>62</td>
</tr>
<tr>
<td>Connecticut</td>
<td>14</td>
<td>5</td>
<td>North Carolina</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dist. of Columbia</td>
<td>1</td>
<td>1</td>
<td>Ohio</td>
<td>70</td>
<td>12</td>
</tr>
<tr>
<td>Illinois</td>
<td>90</td>
<td>24</td>
<td>Oregon</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>Indiana</td>
<td>64</td>
<td>21</td>
<td>Pennsylvania</td>
<td>261</td>
<td>16</td>
</tr>
<tr>
<td>Iowa</td>
<td>48</td>
<td>16</td>
<td>Rhode Island</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Louisiana</td>
<td>1</td>
<td></td>
<td>South Dakota</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Maine</td>
<td>3</td>
<td></td>
<td>Tennessee</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Maryland</td>
<td>25</td>
<td>3</td>
<td>Texas</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>145</td>
<td>13</td>
<td>Utah</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>75</td>
<td>13</td>
<td>Vermont</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Minnesota</td>
<td>101</td>
<td>12</td>
<td>Virginia</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Missouri</td>
<td>17</td>
<td>1</td>
<td>Washington</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Nebraska</td>
<td>18</td>
<td>1</td>
<td>West Virginia</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>35</td>
<td>6</td>
<td>Wisconsin</td>
<td>34</td>
<td>12</td>
</tr>
</tbody>
</table>

Undoubtedly the patients in a very large proportion of the cases in which the nationality was not stated or definitely indicated were
Americans, as it is fair to assume that the nationality when not given by the recorder is more likely to be American than not. Disregarding, among the total number of reported cases, those cases in which the nationality was not definitely stated or clearly indicated, 536 cases of trichinosis reported from the United States were distributed among various nationalities as follows:

German 259, Italian 161, Hungarian 36, American 22, Negro 14, Irish 10, English and Irish 5, Scotch 5, Austrian 4, Norwegian 4, Foreign 3, English 2, Canadian 2, Japanese 1, Polish 1, Syrian 1, Turkish 1, Greek 1, Bohemian 1, Danish 1, Swedish 1, Roumanian 1.

Sources of Infection.

More or less definite statements regarding the pork causing the illness are made in the reports of about 1,200 of the American cases of trichinosis. The most frequent cause was raw sausage, 225 cases; next raw ham, 213 cases; raw pork, 186 cases; sausage, 141 cases; pork, 128 cases; pork not well cooked, 81 cases; raw or imperfectly cooked pork, 74 cases; cooked pork, 70 cases; ham, 24 cases; boiled ham, 19 cases; pork chops, 17 cases; pork roll, 7 cases; lachsschinken, 6 cases.

It is important to note that in all outbreaks reported as caused by sausage, the sausage when its source could be traced was found to have been home-made or prepared in meat shops on a small scale. It is very commonly stated in reports of cases of trichinosis that the sausage responsible for the outbreak was made from one or two hogs, or simply that it was home-made.

Drew' (1892) suspected that Bologna sausage obtained by local butchers from Chicago was responsible for the Colrain, Mass., outbreak of about fifty cases, but this was not definitely shown. An outbreak of twelve cases in Minnesota in 1907 apparently traced back to Federally inspected pork from a large establishment, but in this outbreak a quantity of pork was purchased and then made up into sausage; and the same is true of an outbreak of fourteen cases in the same state in 1910. In brief it may be stated that no cases of trichinosis have been reported which trace back to sausage prepared in establishments conducted on a large scale. While it is not impossible that such cases might occur, the chances seem very remote, for the reason that in such establishments any one lot of sausage is invariably made up of small portions from a large number of hogs, and the infection, if any be present among the hogs involved, is necessarily greatly diluted, with the result that no individual consuming the sausage is at all likely to ingest a sufficient number of trichinae to produce an appreciable effect, even though the parasites should happen to survive the curing processes to which the commercially prepared sausage is subjected. This appears to be the explanation of the lack of cases of trichinosis traceable to commercially prepared sausage. On the other hand, the evident explanation of the frequency of cases traceable to home-made sausage is that such sausage is usually made from one or two hogs, so that there is no dilution of infection if the hog or hogs happen to be parasitized, and, moreover, the sausage is more likely, than commercially prepared sausage, to be consumed in an imperfectly cured condition. For example, the most serious outbreak of trichinosis in the United States so far as concerns the number of cases is that reported by Runckel (1912) from California in which fifty-eight cases with one death resulted from summer sausage made by a farmer and peddled
by him in the neighborhood. Another interesting outbreak is one occurring in Wisconsin about a year ago in which twenty-one cases, resulting in three deaths, developed in five families. Early in December a hog which had been on the farm of the first family for three years was slaughtered and part of the meat made into sausage. The next day some of the sausage was fried slightly and eaten. December 10, 11, and 12 the entire family of eleven complained of stiffness and pain in the legs. A physician was called and diagnosed the trouble as indigestion. This physician learned that the family had recently made some sausage, and he took some home for his own use. Some of this he ate and suffered a mild attack of trichinosis in consequence. It appears also from the history of the outbreak that the physician's father-in-law ate some of the sausage and afterwards died—from grip according to his son-in-law—from trichinosis according to other physicians. Upon the second visit of the physician to the first family, December 23, he found the entire family in bed. December 25 another physician was called in, and he suspected trichinosis from the symptoms and history of the cases, which was confirmed by the discovery of numerous trichinae in the suspected meat. Two of the members of this family died. There were eight cases in three other families which procured some of the sausage immediately after it was prepared and ate it raw or imperfectly cooked. In addition to demonstrating that a physician's mistakes are sometimes dangerous to himself and family as well as to his patients, this outbreak furnishes a striking illustration of failure to diagnose trichinosis, which undoubtedly is very common. If the cases had all been mild, or if only the first physician had attended them it is quite likely that a correct diagnosis would not have been made.

Statistics based on autopsies, although the amount of such data is small, perhaps demonstrate more clearly than the reports of clinical cases that trichinosis is certainly not rare in the United States. Only those series of autopsies in which it appears that trichinae were actually looked for in at least some of the autopsies are considered in the following tabular statement:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glazier, 1881—New York, N. Y.</td>
<td>150</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Glazier, 1881—Newark, N. J.</td>
<td>100</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Glazier, 1881—Philadelphia, Pa.</td>
<td>40</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Glazier, 1881—University of Virginia</td>
<td>150</td>
<td>1</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>Glazier, 1881—San Francisco, Calif.</td>
<td>13</td>
<td>0</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Williams, 1901—Buffalo, N. Y., Phila, Pa.</td>
<td>505</td>
<td>27</td>
<td>5.34</td>
<td></td>
</tr>
<tr>
<td>Osler, 1899—Baltimore, Md., and elsewhere</td>
<td>1000</td>
<td>6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Simonds, 1910—St. Louis, Mo.</td>
<td>100</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Whelpley, 1891—St. Louis, Mo.</td>
<td>20</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Thornbury, 1894—Buffalo, N. Y.</td>
<td>21</td>
<td>3</td>
<td>14.29</td>
<td></td>
</tr>
</tbody>
</table>

The most important of these statistics are those of Williams, as a special examination for the presence of trichinae was made at all of his autopsies, and the series is sufficiently large to give the figures considerable statistical value. Osler's series is larger, but it is not clear whether special attention was given in all cases to the question.
of the presence of trichinae. The autopsies performed by Williams, however, do not represent an average of the population, as rather an undue proportion of subjects came from institutions such as insane hospitals and almshouses. About 75 of the autopsies were upon insane, and nearly 12 per cent of these showed trichinae. Whether this was coincidental, whether it indicates a causal relation between trichinosis and insanity, or whether insane persons are more exposed to infection than sane persons, remains to be discovered.

In view of the fact that trichinosis is an important disease it seems highly desirable that a microscopic examination for the presence of trichinae should be included in the routine followed in human autopsies. In course of time a mass of very valuable data could be accumulated, which would serve various useful purposes. The technic required is simple: A small portion of muscle is taken from a point as near as possible to the bony or tendinous attachment of the muscle, preferably from the diaphragm or its pillars. The tissue in the unpreserved state is then cut into very small pieces with a small pair of scissors and pressed out between two plate glass slides, after which the preparation may be examined with a low power of the microscope at a magnification of 30 to 50 diameters.

Prevalence of Trichinae in Hogs.

The statistics as to the prevalence of trichinae in hogs in the United States are much more satisfactory than those referring to the human host. Formerly a trichina inspection was conducted by the Federal Government upon all hogs whose carcasses, entire or in part, were exported to certain countries, to satisfy the regulations of those countries relative to imported meats. As shown in the following table, a total of over 8,000,000 hogs were inspected microscopically during the period of nine years, 1898-1906. Of these, 1.41 per cent contained living trichinae, in addition to which 1.16 per cent contained trichina-like bodies or disintegrating trichinae. In other words, on the average and in round numbers, trichinae occurred in one out of every seventy-one hogs, or if dead trichinae and trichina-like bodies are also included, in one out of every thirty-nine hogs.
Table Showing Results of Microscopic Inspection of Hogs For Trichinae in the United States, 1898-1906.

Class A (free of all appearances of trichinae).
Class B (containing trichina-like bodies or disintegrating trichinae).
Class C (containing living trichinae).

<table>
<thead>
<tr>
<th>Date</th>
<th>No. carcasses inspected</th>
<th>Class A</th>
<th>Per cent.</th>
<th>Class B</th>
<th>Per cent.</th>
<th>Class C</th>
<th>Per cent.</th>
<th>Total infested with trichinae and trichina-like bodies</th>
<th>Per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1898</td>
<td>1,927,838</td>
<td>1,892,131</td>
<td>98.148</td>
<td>15,729</td>
<td>0.816</td>
<td>19,978</td>
<td>1.036</td>
<td>35,707</td>
<td>1.852</td>
</tr>
<tr>
<td>1899</td>
<td>2,227,740</td>
<td>2,160,230</td>
<td>96.97</td>
<td>25,913</td>
<td>1.16</td>
<td>41,597</td>
<td>1.87</td>
<td>67,510</td>
<td>3.03</td>
</tr>
<tr>
<td>1900</td>
<td>999,554</td>
<td>968,405</td>
<td>96.88</td>
<td>11,701</td>
<td>1.17</td>
<td>19,448</td>
<td>1.95</td>
<td>31,149</td>
<td>3.12</td>
</tr>
<tr>
<td>1901</td>
<td>733,196</td>
<td>715,529</td>
<td>97.59</td>
<td>8,668</td>
<td>1.18</td>
<td>8,999</td>
<td>1.23</td>
<td>17,667</td>
<td>2.41</td>
</tr>
<tr>
<td>1902</td>
<td>681,865</td>
<td>664,288</td>
<td>97.42</td>
<td>10,085</td>
<td>1.48</td>
<td>7,492</td>
<td>1.10</td>
<td>17,577</td>
<td>2.53</td>
</tr>
<tr>
<td>1903</td>
<td>489,667</td>
<td>477,195</td>
<td>97.45</td>
<td>7,394</td>
<td>1.51</td>
<td>5,078</td>
<td>1.04</td>
<td>12,472</td>
<td>2.55</td>
</tr>
<tr>
<td>1904</td>
<td>315,045</td>
<td>307,621</td>
<td>97.64</td>
<td>4,773</td>
<td>1.52</td>
<td>2,651</td>
<td>0.84</td>
<td>7,424</td>
<td>2.36</td>
</tr>
<tr>
<td>1905</td>
<td>346,026</td>
<td>336,623</td>
<td>97.28</td>
<td>5,666</td>
<td>1.64</td>
<td>3,737</td>
<td>1.08</td>
<td>9,403</td>
<td>2.72</td>
</tr>
<tr>
<td>1906</td>
<td>586,997</td>
<td>523,945</td>
<td>97.57</td>
<td>6,220</td>
<td>1.16</td>
<td>6,832</td>
<td>1.27</td>
<td>13,052</td>
<td>2.43</td>
</tr>
<tr>
<td>Total 1898-1906</td>
<td>8,257,928</td>
<td>8,045,967</td>
<td>97.43</td>
<td>96,149</td>
<td>1.16</td>
<td>115,812</td>
<td>1.41</td>
<td>211,961</td>
<td>2.57</td>
</tr>
</tbody>
</table>
Effects of Heat Upon Trichinae.

With reference to the effects of high temperatures upon the vitality of trichinae, various statements are found in the literature which seem to have for the most part rather imperfect experimental evidence as a basis. From a rather small series of experiments conducted within the last two years, I have found that encysted trichinae regularly die when exposed for a short time to a temperature somewhere between 53° and 65° C. This series should perhaps be enlarged by further experiment before final conclusions are drawn. Meanwhile, however, 137° F. (about 68° C.) has been adopted by the Bureau of Animal Industry as a minimum temperature necessary to the destruction of the vitality of trichinae by heat, thus allowing a considerable margin above what is probably the actual minimum. Experiments in the cooking of hams, various sizes and styles of sausages, and other pork products, at various temperatures in water, air, steam, etc., to determine the time required to bring the temperature of the interior up to the thermal death point of trichinae have not yet been completed. It may be noted, as perhaps of interest, that to raise the temperature of the center of a 15-pound ham from 46° F. to 137° F., by cooking in water maintained at a temperature of 180° to 185° required about three and one-half hours, or about two and one-half hours from 78° to 137°, and that a ham of the same size when cooked at a temperature of 160° to 165° required about five hours cooking before the temperature at the center reached 137° from an initial temperature of 78°, whereas the temperature at the center of a frankfurter sausage four inches long by three-fourths inch in diameter and a little over an ounce in weight will reach 137° F. from an initial temperature of 78° in less than ten minutes when cooked in water at a temperature of 160° F. It may also be of interest to note that in meat packing establishments under Federal inspection the cooking of all cooked meat products containing the muscle tissue of pork is required to be sufficient to insure the destruction of the vitality of any trichinae which may be present.

If their vitality is not destroyed by artificial means, encysted trichinae may remain alive in meat for long periods, in fact for many months, after the death of their host. Even ordinary decomposition of the meat does not materially affect them. Drying, however, is speedily fatal to encysted trichinae; by this is meant not partial drying, but desiccation such as, for example, may be accomplished by exposing finely chopped meat in a thin layer to the dry atmosphere of an ordinary steam-heated room.

Effects of Low Temperatures Upon Trichinae.

The great resistance of the larvae of Trichinella spiralis to low temperatures has long been accepted as an established fact. Actually, however, it belongs more nearly to the category of what may be styled the traditions of parasitology which have been passed on from one writer to another without due regard to the evidence upon which they are based.

Prior to recent investigations, the amount of experimental work which has been done on the effects of cold upon trichinae has been very small, as will be seen from the following historical summary.

Leuckart (1863a, 120) states that trichinae are in the highest degree resistant to cold and frost. He exposed some trichinous meat to the coldest January weather (−18 to −20° R.; −4 to −13° F.; −50 to
—25° C.) for three days and nights. After thawing the meat he fed it to a rabbit, which died a month later of trichinosis and was found to be very heavily infested. In another publication (1866a, 91) Leuckart notes that the place in which this meat was kept was somewhat protected, and it may therefore be presumed that the temperature to which the meat was actually exposed was probably not as low as indicated by the figures given. Leuckart remarks, however, that the meat was solidly frozen throughout.

Fiedler (1864, 466) exposed the leg of a trichinous rabbit to an outdoor temperature of —15 to —17° R. (—1.75 to —6.25° F.; —18.75 to —21.25° C.) from January 6, 5 p.m., to January 7, 8 a.m., that is, for fifteen hours. Examined on a warm stage, the trichinae showed no movement. Some of the meat was fed to two rabbits January 7, and February 7, a month later, the rabbits were killed. In one of them a few encysted trichinae were found. January 16, he fed two rabbits with some trichinous meat which had been cut in fine pieces and exposed eighteen hours to a temperature of —11 to —12° R. (7.25 to 5° F.; —3.75 to —15° C.). February 14 the rabbits were killed and carefully examined. No trichinae were found.

Rupprecht (1864a) exposed trichinous meat during one night to an outdoor temperature of —18° R. (—8.5° F.; —22.5° C.) and found that the vitality of the trichinae was not affected.

Kühn (1865b), according to Leuckart (1866a, 91), found that trichinous meat kept in an ice chamber for one and one-half months was still infectious, and that the trichinae had lost their vitality only after the meat had been kept for two months in the ice chamber, the temperature of which was not given.

Gibier and Bouley (1882a) exposed some trichinous ham four hours to temperatures of —27° C. (—16.6° F.) and —20° C. (—4° F.). In the first case the interior temperature reached —20° C. (—4° F.) and in the second —15° C. (5° F.). All of the trichinae were found to be dead. They showed no movement when warmed and stained in a few minutes with anilin blue, methyl-anilin violet, and picrocarminate of ammonia. Some of the meat which had been frozen was fed during eight days to five birds, which when examined later showed no trichinae in the intestine nor had any been found in the feces. Trichinae from portions of the ham which has not been frozen were active when warmed to 40° C., and remained transparent and colorless for several days in staining solutions. Five birds of the same kind and age as the one to which the frozen meat had been fed were similarly fed with the ham which had not been frozen, and large numbers of trichinae were afterwards found in the feces and intestines.

These experiments of Gibier and Bouley seemed to show pretty clearly the destructive effects of low temperatures upon trichinae, but later Gibier (1889a) came to the opinion that the death of the parasites was to be explained on the grounds that they had already suffered a reduction in vitality from the action of salt, and hence readily succumbed to freezing. This opinion was based on the results of an experiment in which he exposed small fragments of fresh trichinous pork for two hours to a temperature of —20 to —25° C. (—4 to —13° F.). The parasites, when afterwards examined on a warm stage, were found to have lost none of their activity.

From the foregoing it would appear that the usual statements found
in articles relating to *Trichinella spiralis* as to the resistance of this parasite to low temperatures have their principal basis in Leuckart’s single experiment, to which may be added as supplementary support, Fiedler’s first experiment, Rupprecht’s experiment, and Gibier’s experiment, a total of four experiments. Kühn’s experiment perhaps has been considered as affording additional supporting evidence. The results of Fiedler’s second experiment do not offset the results of his other experiment, and those of Leuckart and Gibier, as the failure to get an infestation in the two rabbits which were fed meat exposed eighteen hours to a temperature of 7.25 to 5° F. might have been brought about by something else than low temperature. Likewise the results of Gibier and Bouley when compared with those of Leuckart, Fiedler and Gibier, tend to show only that trichinae are sometimes killed when exposed for a short time to temperatures below zero. The later explanation by Gibier (1889) that the trichinae used in these experiments had lost so much vitality on account of previous salting of the meat that they succumbed, whereas they would not have done so if the meat had been fresh, has been accepted by those authors who have mentioned Gibier and Bouley’s work. It should be noted, however, that in the experiment upon which Gibier (1889) based his explanation of the results of the earlier experiments by himself and Bouley, the meat was exposed only two hours as compared with four hours in the earlier experiments.

Although the evidence available heretofore has apparently favored the assumption that trichinae are very resistant to low temperatures, rather than that they can be destroyed by exposure to cold, too much weight has been given to this evidence. Certainly the experimental work bearing on the question of the resistance of trichinae to cold has been altogether insufficient to warrant the usual statements as to the great resistance of these parasites to low temperatures. Because one investigator found that in a single experiment the trichinae survived in meat exposed three days to a low temperature, possibly —4 to —13° F., but probably higher; another that some survived in meat exposed to a temperature slightly below 0° F. for fifteen hours; another that trichinae survived in meat exposed to a temperature of —8.5° F. over night, and still another that exposure to a temperature of —4 to —13° F. for two hours was insufficient to kill the parasites, it does not necessarily follow that longer exposure to cold will not destroy their vitality. In fact, recent investigations, some of which have already been reported briefly (Ransom, 1914), indicate that cold has a very marked effect upon trichinae, and that trichinous meat can be rendered innocuous by holding it in a frozen condition for two or three weeks, provided the temperature is kept sufficiently low.

The series of investigations in question is not yet completed, but thus far seventy-five or more experiments have been carried out. To determine the effects upon the vitality of the trichinae in the various lots of meat that were subjected to freezing in these experiments, direct examination of the trichinae was made under the microscope, and also portions of the meat were fed to experimental animals—usually white or hooded rats—which had been reared from birth surrounded by special precautions to prevent accidental infestation, though in some cases rats had to be used whose previous history was not fully known. Some guinea pigs were used in a few cases when rats were not available. Altogether not less than 20,000 individual trichinae from frozen meat have been examined to determine the effects of freezing and not less
than 350 experimental animals have been used in testing frozen trichinous meat. These figures do not include unfrozen trichinae examined for comparison with frozen trichinae, or the experimental animals employed to test the original infectiousness of the various lots of meat, portions of which in all except a very few of the experiments were fed unfrozen to provide controls upon the results of feeding the meat after freezing.

As no compilation has yet been made, the results of the experiments can not here be given in detail. In the form of a generalized statement, however, it may be said that temperatures of 15° F. and less have a pronounced effect upon encysted trichinae, the effect being more pronounced the lower the temperature. Scarcely any trichinae have been found to survive in a viable condition an exposure of fifteen days to a temperature of 12° F. Although a large proportion may still be alive and exhibit more or less activity when examined on a warm stage, they have been influenced in such a way that either no infection occurs when they are fed to experimental animals, or the infection when rarely produced is very slight. When exposed to a temperature of 0° F. for fifteen days encysted trichinae practically never show afterwards any signs of activity when examined on a warm stage, and have invariably failed to produce infection in experimental animals. Just how the freezing acts to destroy the vitality of the parasites has not yet been determined. Possibly the injurious effect is brought about by the precipitation of colloids from the protoplasm consequent upon the freezing of the medium of solution and by the solidification of one or more substances in the protoplasm, which, after remaining for a while in a solid or semi-solid condition, are no longer able to resume their former relations in the protoplasmic complex. Frozen trichinae, after thawing, show among various visible changes an abnormal granulation of the protoplasm of the cells in the cell body, this granulation as a rule being more conspicuous the lower the temperature to which the parasites have been exposed. The brownish color of the cell body is almost entirely lost in individuals exposed for two weeks to very low temperatures near 0°, this color as a rule approaching normal in those exposed to 10°, and still more nearly normal in those exposed to 15°. The nuclei of the cells in the cell body are found after thawing to be solidified in the parasites which have been exposed for two weeks to temperatures of 10° or lower, whereas in those which have been exposed a similar length of time to a temperature of 15° this solidification affects only the central portion of the nucleus. The normal nuclei of the cell body, it may be noted, are vesicular and transparent. More or less marked changes are also seen in the ovary or testis in frozen trichinae. In the normal parasite the germ cells are compressed together into an elongated rather hyaline mass with no spaces between the cells. The evident changes in the ovary or testis are comparatively slight in trichinae which have been exposed to 10° and 15°, there being however a slight tendency toward dissociation of the germ cells, this tendency becoming very marked in those which have been exposed to lower temperatures. In trichinae which have been exposed to a temperature of 5° for two weeks the individual germ cells are commonly seen to have more or less globular shape and to be no longer in intimate contact with one another. In some cases, instead of dissociation of the germ cells the entire ovary or testis presents a diffuse granular appearance very similar to that seen in these organs in the case of trichinae which have been dried and then moistened again. In many respects trichinae which have been frozen resemble those which have been dried. As yet, however, no comparison of the appearance of
frozen trichinae with that of individuals which have been very gradually dried has been made, and as ordinary drying produces such extreme changes in appearance, it is not possible to state whether the difference in the visible effects of freezing and drying is one of kind or merely of degree.

It should be noted that there is no perceptible difference in the effects of a given low temperature whether the meat is exposed in a small quantity of a pound in weight, in a quantity of 100 pounds in a rectangular package, in a quantity of 350 pounds in a barrel, or as an entire hog carcass. Necessarily the rates of fall in temperature when the meat is placed in the freezer, and the rates in rise of temperature when it is removed vary in these different cases according to the size and form of the package, other conditions being the same. Obviously the temperature of a pound of meat would become reduced or raised throughout to that of the surrounding medium much more rapidly than that of a barrel of meat. In fact it was found by experiment (only one such experiment was carried out, however), that about a week was required for the center of a barrel of meat originally at a temperature of 32° F. to reach a temperature of 5° F. when placed in a freezer kept at this temperature.

The recently discovered facts as to the injurious effect of low temperatures upon the vitality of encysted trichinae, outlined above, have already been given a practical application under one of the provisions of the Federal meat inspection regulations, which prohibits the use of the muscle tissue of pork in products prepared customarily to be eaten raw unless the pork has been subjected to a temperature sufficient to destroy trichinae, or to some other process approved by the Chief of the Bureau of Animal Industry. That is, the pork in such products must either have been exposed to a sufficiently high temperature to insure the destruction of any live trichinae (about 140° F.), or held for twenty days at a temperature not exceeding 12° F. This regulation affects such products as summer sausage of various kinds, prosciutto or Italian hams, Westphalia hams, capicola, and lachsschinken.

Effects of Salt Upon Trichinae.

Adequate data as to the effects of salt upon the vitality of encysted trichinae, a very important question from the practical standpoint in connection with cured meats, are not yet available, but, supplementing the work of earlier investigators, extensive experiments bearing upon this point are now in progress. In anticipation, however, it may be stated that it appears likely that certain curing processes, if properly carried out, are efficient in destroying the vitality of encysted trichinae, although the possibility that living trichinae in calcified cysts may escape the action of salt because of the assumed impermeability of the cysts offers a complication. It is nevertheless not improbable that investigation will show that at least some of the various classes of cured pork products can be sufficiently safeguarded so far as concerns the danger of trichinosis, by controlling the curing processes, and that the additional safeguard of refrigeration will become unnecessary.

Prophylaxis.

The prophylaxis of trichinosis is largely a question of live stock sanitation. If the disease be eradicated from hogs it will, as a matter of
course, disappear among human beings. The most important points in preventing the infestation of hogs are:

The destruction of carcasses of hogs which die on the farm in such a manner as to prevent other hogs or rats from feeding upon them.

Prohibition against the feeding of garbage and slops which may contain pork scraps to hogs.

Prohibition against the feeding of offal or other unsterilized waste from slaughter houses to hogs.

Unfortunately there is a common and widespread carelessness in regard to the disposal of the carcasses of dead animals on farms, but various agencies are at work, important among which is the active propaganda for the eradication and control of hog cholera, which will undoubtedly greatly improve live stock sanitary conditions on the farms and hence also greatly reduce the prevalence of trichinosis in hogs.

The microscopic inspection of pork in one way acts as a safeguard against trichinosis in man, but in another tends to promote the occurrence of human trichinosis. Although a universal microscopic inspection would eliminate most of the trichinous hogs, such an inspection is as present out of the question in this country, where 40 per cent of all food animals slaughtered do not receive Federal inspection, and moreover even under universal microscopic inspection many trichinous hogs would escape detection owing to inherent and practically unavoidable defects in inspection. For example, Stiles has shown that nearly one-third of all the recorded cases of trichinosis occurring in Germany during the period 1881-1898, several thousand in number, were caused by hogs inspected and passed as free from trichinæ. Admitting, however, that microscopic inspection would serve to prevent many cases of trichinosis which would otherwise occur, it would seem that the mere fact of the existence of a trichina inspection would tend to create a sense of false security in the minds of the public, and hence encourage the dangerous custom of eating raw pork, a custom which, fortunately in view of the rather high percentage of trichinæ among American hogs, is not yet so common in this country as it is in certain other countries.

It therefore seems that the adoption of a microscopic inspection of pork by the Federal meat inspection service is not justifiable; furthermore, the great expense of such an inspection is a serious difficulty. Upon the basis of a probable cost of at least 15 cents for each carcass examined for trichinæ, not less than $5,000,000, in addition to the present meat inspection appropriation of over $3,000,000, would be required for the microscopic inspection of the 30,000,000 or more hogs slaughtered annually under Federal supervision. Realizing the practical difficulties in the way of a general microscopic inspection, which on this account alone seems out of the question at the present time even if it were desirable, the Federal authorities have in recent years given serious consideration to the question of a limited microscopic inspection to include the hogs from which pork is taken for use in products prepared customarily to be eaten raw. Such a measure, to the extent that protection by means of microscopic inspection is possible, would tend to afford partial protection to the consumer of such products, in so far as concerns products prepared under Federal supervision. In the light of the investigations referred to in this paper, however, it seems that the adoption of requirements for refrigeration, properly controlled curing processes, etc., provides a better solution of the problem of safeguarding the products in question, and the Federal meat inspection authorities
have consequently adopted this plan instead of attempting further to obtain the appropriations necessary for a microscopic inspection.

The most important of all measures of prophylaxis against human trichinosis is the education of the individual as to the danger of eating pork raw or in an imperfectly cooked state. Public health officials, physicians, and other agents in the movement for better sanitation, should not neglect the duty of discouraging the dangerous practice of eating raw pork, and of encouraging all consumers of pork to see that it is properly cooked before it is eaten.
MORNING SESSION, FEBRUARY EIGHTEENTH.

SUGGESTIONS RELATIVE TO THE CONTROL OF INTERSTATE MOVEMENTS OF LIVE STOCK.

J. I. Gibson, Des Moines, Iowa.

There never was a time when the value of complete supervision of all interstate movements of live stock could be so appreciated as at the present time. The present widespread outbreak of foot-and-mouth disease has made records of shipments of great value, not only in the tracing of suspicious shipments but in the furtherance of eligible shipments of live stock and the prevention of shipments ineligible.

When it first seemed probable that the foot-and-mouth infection might reach the Chicago yards, we at once began an investigation of shipments of live stock from Chicago to the State of Iowa. The Federal quarantine of the five Illinois counties on account of the existence of tuberculosis brought into use a special permit—F. I. Form No. 51—issued by the United States Department of Agriculture. Upon raking our files we found about thirty such shipments covered by this Form No. 51, and immediately proceeded to put all of these shipments under provisional quarantine at destination. In a short time it was found that six of these shipments had carried the infection; they were all held under close observation and the disease developed in one shipment twenty-eight days after leaving Chicago. I mention these facts to show the importance of having a health certificate or invoice of all interstate movements of live stock on file in the office of the sanitary authorities of the states of origin and destination.

We may have sometimes thought it unnecessary to have the car numbers in connection with all such shipments but this outbreak of foot-and-mouth disease has taught us the wisdom of requiring the car number in connection with all shipments interstate because in this instance it was of just as much importance that the cars be all traced and disinfected as that the shipments of stock be located and quarantined; inasmuch as in a widespread outbreak, covering several states, it becomes the duty of the Federal authorities having jurisdiction over interstate shipments to take control of such an outbreak; it seems to me it would be wise to require a copy of every health certificate covering shipments of live stock interstate to be furnished the Department at Washington and then in the event of an outbreak of any serious communicable disease among live stock, the Federal authorities would have their own records. I believe also that with such a requirement we would get a higher class of inspection and tests, inasmuch as the inspectors of the various states would be required to live up to the Bureau standards in the work of inspecting and testing; and I, for one, would gladly hail any change that would raise the standard of this work. In this connection I would suggest that the uniform certificate previously adopted by this Association and copied after the Bureau form of certificate should have a space set apart for the registration of the numbers of the cars in which stock are shipped. There is still a tendency on the part of many shippers to try to evade all regulations
and to get shipments over the road from one state to another without a proper record being made of such shipment.

In compliance with this suggestion of furnishing the Bureau with a copy of all health certificates it would become necessary to issue a uniform health certificate in quadruple form instead of in triplicate form, as heretofore. This would entail a small additional expense to each State Department and to the Bureau at Washington as well, but I am convinced that we have been too fearful of the expense incurred in connection with the protection of the live stock industry of the United States.

The only appropriation for the carrying on of this very vital work in the State of Iowa is an annual one of $11,000, outside of the salaries paid in the office of the state veterinarian. We have about concluded that this appropriation would be reasonable for the protection of the live stock interests in one county in Iowa, it amounting to about one-third of one per cent of the live stock value of a county in Iowa. We will never arrive at the complete and satisfactory supervision of live stock shipments interstate until we get together for uniform requirements in the various states. With uniform requirements and laws holding the common carriers responsible for the movement of any live stock not having proper inspection, test, and certification, we would get much better results than we have heretofore. Under such regulations all recognized inspectors in the various states should be on the same basis as the collaborating veterinarians employed in the control of foot-and-mouth disease and their commissions should be subject to cancellation by either Federal or state authority when they are found guilty of violation of the rules and regulations or guilty of falsifying any inspection or test record. Also the uniform regulations should provide for severe penalties on the inspectors and the common carriers as well as the owners of the live stock. There is need of definite and severe penalties on all parties who, in order to avoid the regulations, constantly endeavor to trail their live stock across state lines, whether inland, over bridges, or across the ice. The public generally do not seem to realize that an interstate movement of live stock trailed or driven across the state lines on established highways, bridges, or over the frozen streams is just as important in regard to sanitary matters as is an interstate movement by rail or boat, and to correct this error in the minds of the public severe penalties should be provided. It might be well to mention the fact that we believe there should be no hesitancy on the part of any state sanitary commission or officer to fully and promptly co-operate with the Federal authorities in all matters pertaining to live stock sanitation.

There is one other matter that I would like to mention, and that is the disinfection of cars and railway yards. I have been telling our farmers that while this foot-and-mouth disease was an expensive thing, I believe that the amount of disinfection that was carried out around the cars and railway yards would doubtless protect our hogs next year to the extent of reimbursing them to the cost of the foot-and-mouth disease outbreak.

I think that all cars at all times should be disinfected at terminals following shipments, and for this purpose, unless it should interfere with the running gear of the cars, a dip track, in my opinion, would be the cheapest way of disinfecting the cars; to simply run them over a dip track. Such a track could be constructed just large enough to accom-
moderate the largest cars, and passing them slowly through this dip would render them clean and wholesome for shipment again. So I would like to see laws in all states, and interstate laws requiring the disinfection of live stock cars at all times.

I find that the breeders of good stock feel that they are woefully handicapped in moving their good stock. They are compelled to put their stock in box cars, and in the hot weather they ship poorly for want of ventilation; whereas, if the general disinfection of cars were carried out in a proper manner the breeder of live stock could order a stock car if he wanted to ship his stock to a state fair, and feel that that car was clean and wholesome. So I believe that the disinfection of cars is a very important matter, and one that has been neglected in the past. (Applause.)

Dr. Kigin: I heartily approve of Dr. Gibson's idea of state and Federal co-operation, and to have this system of testing changed and bettered. It was about a year ago this month that my attention was called to some 400 head of cattle that had been shipped into Nebraska from Illinois. I began to trace this down, and the way I got a clue to this shipment was that there was a man who was going to ship an emigrant car from Nebraska to Minnesota. He had his cows tested, which he had purchased from a man in the northwestern part of the state, and 85 per cent of the cows reacted. He reported this to me, and I traced back and found about 400 head had come in. I went to the railroad company and asked if a test chart had accompanied the way-bill. It was literally impossible for me ever to find that out. I do not know today that a test chart accompanied the way-bill. They claim that this was sent to Chicago, to the auditing department, and I immediately demanded that there be a test chart brought forth, or I would quarantine the entire herd. Of course they were scattered out, they had been sold, and they had gone over an area of about 100 miles in that section of the state.

The test chart could not be produced, and therefore I issued a quarantine, and it cost me something like $500 before I finished testing those cattle. I had them brought from as far as 25, 35 or 40 miles, and bunched them so we could test, and in conclusion I had tested 385 head. I posted 9 which had died, and I found old, extensive tubercular lesions. There were 102 head out of the 385 that reacted.

I took this matter up with the railroad over which these cattle were shipped, and asked them if they would grant me one favor, to send me every test chart that accompanied the way-bill on any live stock into the State of Nebraska. They first objected, but I told them that they had violated the law if they could not show this test chart, and that I would make
an investigation that possibly they would not want made. It really was a big proposition for me to go against a big railroad company and make that demand, but they very readily, after they saw the situation, stated that they would furnish me with those test charts. I began immediately to go to all the railroad companies, and wrote them letters, stating what I wanted. One of them thought that I wanted a copy of the rate book, and if I wanted that they would send me a copy. But I went to Kansas City, Missouri, and Norfolk, Nebraska, and Omaha, and had a talk with the different railroad companies and explained what it meant to them, and what it meant to the state, to receive the test chart that accompanied the way bill. One railroad company insisted that they only made the copy, and sent in the copy, but I told them that I did not want that, as I could not get the character of the chart; that I wanted to know as to its uniformity, etc. After some six months, going from one department to another, and from one man to another in this particular railroad company, they finally agreed, and I can say today that I have received in my office every test chart that accompanied the way-bill of every live stock shipment in the State of Nebraska. The result has been that I have quarantined four times as many shipments as I was able to do before that. It always gives me a clue to work on to find out if those cattle have been tested by a reliable man. I believe that that is the best system, under the existing conditions, that we possibly could adopt in the state, and I believe, furthermore, that if you go to the railroad companies, to the different state veterinarians of the different states, and work with them, and explain the benefit that it will be to the live stock industry, and in an indirect way what a great benefit it will be to the railroad companies—I do not believe that the veterinarian will have much trouble in getting those things into his office.

Now there was one railroad company that asked me to send their test charts to their auditing office after I had looked them over, which I agreed to do. But the other railroad companies asked me to keep them on file in the office where they might call for them and receive them if any trouble arose.

Later on I took this matter up with the Sanitary Board and told them how far I had gotten along with the railroad companies, and we tried to devise another plan that would be a sort of protection to the State of Nebraska, as well as every other state. I sent out a circular letter to all the veterinarians in the state explaining to them the necessity of better test-
ing. I sent them all quite a lengthy letter, and to the few men who have come into the state in the two years previous I wrote a long personal letter. I wrote to them from every standpoint, of the benefit of testing and the necessity of making the test, and of branding the cattle.

The Board a year ago issued the order that all cattle that reacted in the State of Nebraska must be branded on the left jaw with the letter “T,” not less than three inches in height, and that it must be branded deep enough so that the hair would not grow out. Since that we have branded every reacting cow in the state, which, I believe, is one of the most important things that could possibly have been done. Now that is really off the subject as to the interstate shipment, but how many cows have been slipped in that that description would fit; a shipment that has imposed upon some other state, and possibly upon some healthy herds!

The next step that we took, in order to separate the states that shipments might go into, our neighboring states and the other states, was to commit all the veterinarians that were permitted to use the test to an oath of office, and I can say that since that time I have called in seven of those commissions, and I have given a warning that as long as I am the head of that department, which I will be until possibly April or May of this year, that I will enforce the penalties of the law. I realize that that is a stand that will not make me very popular among a certain class of men and among a certain class of veterinarians, but at the same time when a man realizes what it means and what is required of him when he has given his oath, which means everything to a man in life, I believe that it is up to him, even though he loses his job to do everything possible in order to accomplish what is best for the state and for everyone concerned.

I believe that in two years the plan that Dr. Gibson has outlined here this morning will be in effect, and I want to say that if there is anything that I can do toward accomplishing that end I will do it, and I sincerely hope that every man, sanitarian, farmer, veterinarian, or whoever he may be, will stand back of Dr. Gibson’s idea expressed here this morning, and get the states and the Government closer together in cooperation. We will turn the matter over to the Government and give the Government a report of all of the tests that are made. I am sure that even in the state tests the Government would be willing to go to the extra expense of handling those papers in Washington. Many of the states, and I am not
criticising them, have not adopted the uniform health certificate or test chart even today, and it really seems to me that it is more or less carlessness on their part in not sending out these uniform certificates, because it really relieves a man in a state department a great deal when he sees a chart come in that is uniform, with the approval on it of the state veterinarian of another state. Generally we can then rest assured that the test has been made as nearly right as a man can make it. But when it comes in on all kinds of scrap paper, and on this and that, it is really very discouraging, when we consider the great value of this test to the live stock industry of this great American nation. (Applause.)

Dr. Torrance: Mr. President, I would like to say something in regard to the importance and practicability of the disinfection of railroad cars. In Canada we have always looked upon this as a most important business, and the railroads under our laws are obliged to disinfect all stock cars when they reach terminal points, at their own expense. We furnish inspectors under whose supervision the railroad officials carry out this work. After the work is completed each car has a card tacked on it, bearing both the signature of the inspector and the certificate that it has been inspected under his supervision. No railroad company is allowed to load live stock into a car until it has one of these cards on it showing that it has been disinfected.

The railroads have given us very little trouble in carrying out this law. They seem willing to co-operate with us. At all the large terminal points they have plants arranged for the disinfection of these cars. The litter and manure is taken out and disposed of and the car is then washed, and afterwards either sprayed or has disinfectant applied to it with a brush. Our live stock shippers have gotten so accustomed to this treatment that they will refuse to load live stock into a car that through some accident or other is provided without this necessary cleansing. The farmers who ship to expositions demand these clean and disinfected cars, and I believe it is one direct and useful method in the control of contagious diseases.

Mr. Charles Graff: Mr. President, I feel as though I would like to make a remark along these lines this morning, though I feel considerably lost in this body of men. I do not want you to refer to me as "Doctor!" I am not a doctor. I am here, gentlemen, representing the stock breeders of this country, and I want to say that while this is the first time
I have been present at your sessions, yet I have read something about them, and I feel that I have been greatly benefited by being here this morning and hearing the different subjects discussed in which the breeders of this country are vitally interested.

If it were not for the seriousness of the matter it would amuse a fellow to hear some of the troubles that people from different states have aired here this week, and particularly the gentleman from Illinois who the other day made his report on foot-and-mouth disease in this great state. It is a great state, gentlemen, and there are great people living in it. Great people who have been raised here—I was raised here myself. (Laughter.) Illinois is a wonderful state. It does many wonderful things, some peculiar things. I noticed a few years ago its legislature was in session all winter, and finally claimed they elected a United States Senator, but when he came down to Washington the United States Senate said "I am from Missouri," and they sent him back home. I noticed in the press the other evening that they now, after seven weeks of hard labor, have finally selected a Speaker of the House of Representatives in this State. Now if that was in Nebraska or Iowa or some other of those states where, when they get ready to do things they do them, that would not happen. I believe the people of Illinois had better demand a change of venue for the next State Legislature and turn the matter over to some sister state and let them organize for them, and get them to work.

I want to say to you that in regard to the interstate shipment of live stock the breeders today feel that they have a grievance, and I want to say to you that I am not speaking for those breeders that I put in a class with the speculators, those fellows who have done business in Illinois, and have infested the State of Nebraska with a lot of rotten cattle, about which Dr. Kigin has just spoken to you. We have no sympathy for those fellows. We are with you to put them out of commission. But we do feel that the reputable and substantial breeders of improved live stock should have a square deal. I believe under the present tuberculin tests, the regulation of the same, as applied at the present time in a number of states, at least where we do business, is unreasonable—it is unjust.

I want to call your attention to a few things. I noticed after coming here, while sitting here and taking in these entertaining and instructive talks, a number of circulars that were laid around on the chairs, among them a report of the Com-
mittee on Uniform Regulations, presented and adopted by the United States Live Stock Sanitary Association at Chicago, December 5, 1912. On looking over the rules that they submitted to this Association, I find nothing wrong, only it seems that the rule pertaining to the interstate shipment of swine has been twisted over and applied to the cattle, as we are doing business today, that is, limiting the test to thirty days. If I have a bull tested out of my herd to go to Iowa, that bull must be shipped within thirty days; if not I have to have him re-tested. Now that provision tells us that after an animal has been tested for tuberculosis, or, in other words, the tuberculin injected into that animal, there is no use in injecting any more tuberculin into it for at least sixty days, because it will not react; there will be no reaction. Now what is the breeder going to do during this time? It seems to the breeders, gentlemen, that they are entitled to more time; after cleaning up their herds, and the animals have been tested, that for a certain period of time, and certainly a great deal longer than thirty days, that breeder ought to be allowed to ship animals out of that herd in interstate shipments.

I rather expected Dr. Kigin from Nebraska to touch upon a matter that the Nebraska Improved Live Stock Breeders' Association had up in the month of December, when a set of rules were formulated, and I hope the doctor will speak upon that subject to this body and explain what the intent was, and what was done at that time.

I believe in eradication, but, gentlemen, I do not believe in eradication to the extent that you eradicate the improved live stock industry of this country. It is easy enough to go too far.

Another matter I would like to mention to you this morning. I have heard so much talk since I have been here about co-operation. I believe in co-operation, but it seems to me, gentlemen, that this Association has not gone as far as it could go in applied co-operation with the breeders of this country. It seems to me that there is the proper place to bring into action co-operation. I am sorry that there are not hundreds of breeders of improved live stock present at a meeting of this kind. I do not know of any place that they could go where they could do themselves more good than they could at a meeting like this. I am extremely sorry that our so-called State Sanitary Board of Nebraska has not a representative here. We fellows on the farm would call them a "cheap bunch." They lack in heft. They do not realize the impor-
tance of the positions they hold, or they certainly would have a representative here at this meeting.

Gentlemen, in adopting any rules with regard to inter-state shipments, I hope you will keep in mind that the breeder, the breeder of improved live stock, is more vitally interested than any other organization or set of men. It can not be otherwise. I would like to see the time when this organization will extend a hearty invitation to the live stock breeders to attend these sessions. I do not mean your business session, but I mean your programs that are carried out here, those sessions that I have attended. The report on foot-and-mouth disease made by Doctors Melvin and Mohler the other day was one of the grandest reports, I believe, that I have ever heard. It is really too bad that more people could not hear that. But I am glad to know that the report is being published, and the breeders are going to be given an opportunity to get hold of it. It is inspiring. Those reports are inspiring. It shows the breeders of this country that we have many competent men nowadays that are taking up these questions as they present themselves, and are able to cope with them. I feel, gentlemen, that going home from this meeting at this time I carry with me the thought that we have some of the biggest men in the veterinary profession that there are in the country; men as big as they have in any other profession. When I look into men's faces and I hear them talk I form an idea of what they are. I have been mixed up with a couple of legislative sessions in Nebraska—and I am very, very thankful that it was in Nebraska and not in Illinois—and I feel that I have had some opportunity to judge men, and I am very glad that I have been here, and I want to thank you for the attention that you have given me. I do not want to take up any more of your time. (Applause.)

REPORT OF THE COMMITTEE ON UNIFORM STANDARDS OF THE EASTERN LIVE STOCK SANITARY ASSOCIATION.

Presented at Albany, N. Y., on October 22, 1914.

October 22, 1914.

To the officers and members of the Eastern Live Stock Sanitary Association:

Your committee which was appointed under a resolution adopted at the last meeting of this Association to prepare uniform rules and regulations for the inspection of live stock and for the control and movement of the same, respectfully submits the following report:

On account of the many questions involved, the committee decided not to undertake at this time to present for your consideration rules and regulations to cover all of the infectious diseases of animals, but
concluded to give its attention to what appeared to be the most important subjects, viz.: the approval of licensed veterinarians for the inspection and tuberculin testing of cattle to be shipped from one state to another, the control of glanders, and the control of hog cholera.

Approval of Licensed Veterinarians for the Inspection and Tuberculin Testing of Cattle.

The regulations which we recommend for this purpose are based upon those adopted at a conference of Live Stock Sanitary officials called by the State Agricultural Commission of Ohio, and are as follows:

- To insure accuracy and uniformity in the use of tuberculin and to create confidence in certificates of inspection and tuberculin test of dairy cows and other cattle, thereby protecting and promoting the livestock interests of the state by providing means for the better control of tuberculosis among farm animals, particularly cattle and swine, the following regulations governing the approval of licensed veterinarians who inspect and test with tuberculin cattle to be shipped from one state to another are hereby adopted:

1. Any licensed veterinarian in good standing who is a graduate of a veterinary school recognized by the United States Civil Service Commission may, upon making proper application on a form furnished for the purpose, become a candidate for approval. Applicants must give their full name and place of residence, where they are practicing, age, school attended, date of graduation, experience in general practice, experience in the use of tuberculin, experience in the practical post-mortem examination of slaughtered reacting cattle, and the names of three character references.

2. Applicants must agree to conduct the inspections and tuberculin tests strictly in accordance with the method approved by the Eastern Live Stock Sanitary Association and the outlines indicated in the certificate of inspection and tuberculin test adopted by the United States Live Stock Sanitary Association in 1912.

3. Applicants must agree to use tuberculin approved by the state authorities for all tests which they may conduct and to report the result of all such inspections and tests to the proper authority of the state in which the inspection and test is made within seven days.

4. Applicants must agree to advise owners of cattle before conducting inspections and tests that the results of such inspections and tests will be reported to the proper state authorities, that all reacting or diseased cattle will be marked for identification by the veterinarian conducting the inspection and test and quarantined under the laws of the state, and that all doubtful reactors will be marked and reported.

5. Owners of cattle desiring to have the same officially inspected and tested must make application for such inspection and test, either through their local approved veterinarian, or through the proper state office, on forms provided for the purpose, and with which local approved veterinarians will be supplied. Owners must make affidavit on these forms as to last tests, or last use of tuberculin on the cattle for which tests are requested.

6. After satisfying the proper officers of the state as to the strictness and competency in the matter of making the tuberculin test, the applicant may be required to state in writing, on a form supplied for that purpose, that he will comply with all the requirements. Approved veterinarians will be supplied with all necessary instructions in regard
to conducting inspections and tuberculin tests as required by state
officials, but such instructions shall not include information concerning
detailed methods of examination and diagnosis of which the trained
veterinarian should be possessed. Forms for health certificates to
accompany cattle intended for shipment to other states will be fur-
nished. Of all material thus furnished a regular accounting will be
required.

7. Failure to live up to the requirements herein stipulated, or
neglect to strictly observe the live stock sanitary laws of the state, par-
ticularly those relating to the report of contagious diseases of animals
that come under their observation, or any of the state regulations, will
be sufficient cause for revoking approval.

8. Certificates of inspection and tuberculin test for cattle shipped
from one state into another will be accepted by the officials of the state
of destination only when the said certificates have been executed and
the inspections and tests conducted by veterinarians whose competency,
reliability and trustworthiness have been vouched for by the proper
state official of the state of origin. All certificates of health must be
executed in triplicate on the regular form officially adopted by the
United States Live Stock Sanitary Association, one copy to be forwarded
to the proper official of the state of destination, one to the proper official
of the state of origin, and the third to accompany the shipment of cattle
and to be retained and filed with the waybill by the transportation
company.

9. These regulations shall take effect and be in force on and after
the first day of July, 1915.

10. Printed lists of veterinarians approved for conducting official
inspections and tuberculin tests for cattle intended for shipment into
other states shall be furnished to the chief live stock sanitary officials
represented in this association, and to such others as may seem
desirable.

11. The above rules shall apply to all official veterinarians, except-
ing the state veterinarians, and it is recommended that the proper state
authorities require applicants for appointment to the position of state
veterinarian to comply with these rules before considering the applica-
tion.

**Regulations for Controlling Glanders.**

1. All clinical cases of glanders must be destroyed at once.

2. All exposed horses or mules must be submitted to the ophthalmic
mallein and complement fixation tests.

3. All animals giving a positive reaction to either the ophthalmic
mallein test, or to the complement fixation test, or to both, yet showing
no physical symptoms of the disease, shall be considered glandered.
Such cases shall be destroyed at once or placed in absolute quarantine
at the discretion of the state veterinarian.

4. The stalls and stables occupied by glandered animals must be
promptly and properly cleaned and disinfected or destroyed under
Federal, state or municipal supervision, after clinical or reacting animals
have been destroyed.

5. Susceptible animals that have been exposed to infection with
glanders in an infected stable must be satisfactorily retested each three
months until no positive cases are found.

6. All clinical cases of glanders and all mallein or blood tests for
glanders must be reported to the proper authorities.
7. An autopsy must be conducted on all non-clinical cases of glanders. The autopsy must be conducted by a qualified veterinarian and the results of the autopsy reported promptly to the proper authorities.

Regulations to Prevent the Spread of Hog Cholera.

1. All importations of swine into the state must be reported in writing to the chief live stock sanitary official by the common carrier, toll bridge and toll gate companies, and any person or persons hauling, driving or passing swine into the state. The report shall be dated the day the swine are handled, shall state the name and address of the consignor, the consignee, the number of hogs in the shipment, and whether the hogs are for immediate slaughter or for feeding or breeding purposes. Apparently healthy swine for immediate slaughter may be brought into the state in accordance with the provisions of Section 3 of these regulations. Swine for feeding or breeding purposes may be brought into the state in accordance with the provisions of Section 4 of these regulations. Blanks for conveniently complying with this section may be had upon application to the proper state official.

2. Swine which are diseased with hog cholera or exposed to that disease shall not be allowed to stray or be moved from one place to another without a written permit from the proper state official or his agent.

3. All stock yards and stock pens shall be considered infectious and the movement of swine therefrom is prohibited except as hereinafter provided:

(a) Common carriers handling swine from stock yards or stock pens, or swine that have within thirty days received the "simultaneous treatment," shall bill them as "exposed to hog cholera" and shall so placard the cars on both sides at the time of loading for shipment and these cars must be cleaned and disinfected under official supervision by the last carrier as soon as unloaded, unless they are to be reloaded at the same point within twenty-four hours with swine being shipped for immediate slaughter. Cars containing swine from stock yards outside of the state shall be cleaned and disinfected after unloading as herein provided for swine cars, with the exception that, if desired, they may be sealed, billed and returned to the point of origin or other disinfecting station, provided that this movement is entirely under the supervision of the Bureau of Animal Industry’s inspectors, under conditions permitted by the said Bureau’s regulations on this subject.

(b) Cars to be disinfected must be sealed as soon as unloaded, placarded on both sides "Exposed to Hog Cholera—Clean and Disinfect," and so billed and forwarded without delay to points agreed upon by the live stock sanitary officials and the railroad company, where they shall be cleaned and disinfected under official supervision, either state or Federal, as provided in Section 7. In no case is a car to be used in shipping more than twice in succession without being cleaned and disinfected.

(c) Exposed but apparently healthy swine for immediate slaughter may be shipped or hauled within the state to approved slaughter houses only under permit and in tight bottomed vehicles that must be disinfected, as directed in Section 7, as soon as unloaded.

4. Swine may be brought into the state for purposes other than for immediate slaughter as provided in this section.

(a) Swine may be given the "serum alone" treatment, with serum prepared under a United States Department of Agriculture license,
immediately before shipment or while enroute, in either of which cases the treated swine shall be disinfected in a two per cent solution of cresol compound U. S. P., or such other disinfectant as may be approved by the Bureau of Animal Industry, and be held in non-infectious pens for at least six hours before being loaded for shipment. The treatment shall be given by a competent veterinarian and his certificate, giving serum license number, weight of hogs and amount of serum used must be approved by an inspector of the Bureau of Animal Industry or a proper official of the state where treatment was given. A copy of such certificate shall be attached to the waybill and accompany the swine to destination. The original certificate is to be mailed to the chief live stock sanitary official of the state of destination upon completion of infections. Cleaned and disinfected cars must be used.

(b) Permission may be secured from the chief live stock sanitary official to have the “serum alone” treatment given to swine after arrival at destination instead of at point of origin or en route, but in this case a written permit must be secured prior to shipment and must accompany the swine to destination. The treatment at destination must be made by an officially approved, qualified veterinarian, with serum prepared under a United States Department of Agriculture license and within twenty-four hours after arrivals, after which the swine shall be disinfected with a two per cent solution of cresol compound U. S. P., or other disinfectant approved by the Bureau of Animal Industry. Such swine must not be placed with or in close proximity to native swine for two weeks after arrival and, then only if apparently healthy.

(c) Swine that have received the “simultaneous treatment” must not be brought into the state until at least thirty days have elapsed from date of treatment, except on written permit from the proper state official. Such animals brought in on permit will be placed under quarantine on premises of consignee until at least thirty days have elapsed from date of treatment. Quarantine will then be revoked in writing if no indications of cholera are apparent.

5. All outbreaks of hog cholera must be immediately reported to the proper live stock sanitary official. All premises where hog cholera exists shall be placed in quarantine, the quarantine to continue for thirty days after disposal of the last known case of cholera. Exposed swine not showing clinical symptoms shall be given the “serum alone” treatment. Hogs showing no visible symptoms of the disease may be removed under permit and in accordance with paragraph (c) of Section 3 from the premises for immediate slaughter under official inspection. All swine that have died or have been destroyed on account of hog cholera must be disposed of in accordance with the laws of the state, or in the absence of such laws, by one of the following methods: First, complete cremation of the entire carcass with all its parts and products. Second, boiling the carcass and all its parts and products in water or heating the same with steam at the temperature of boiling water, continuously during at least two hours. Third, burial of the carcass and all its parts and products in such place that shall not be subject to overflow from ponds or streams, and which shall be distant not less than one hundred feet from any water course, well or spring, public highway, house or stable. In burying such carcass it shall be covered with quicklime to a depth of not less than three inches, and the top of such carcass shall not be within two feet of the surface of the ground when such grave is filled and smoothed to the level of the surrounding surface. Such grave shall
be so protected that the carcass may not be accessible to dogs or other animals.

6. Where practicable special arrangements may be made with the chief live stock sanitary official to have swine given the "simultaneous treatment." All swine so treated must be quarantined and isolated for at least thirty days from date of treatment or disposal of last case of cholera. They must be given an antiseptic bath with a two per cent solution of cresol compound U. S. P., or other disinfectant approved by the Bureau of Animal Industry, before being allowed to come in contact with susceptible swine. The premises occupied by swine during the period of immunization must be disinfected before the quarantine is removed.

7. All cars, pens, yards, chutes and other enclosures or places containing or exposed to diseased swine shall be cleaned and disinfected under official supervision as soon as possible after removal of affected or exposed swine in the following manner:

Remove all litter and manure and mix it thoroughly with air-slacked lime. Saturate the interior surfaces of the cars and the woodwork, flooring and the ground of the chutes, alleys and stock pens with a solution made with four ounces of cresol compound U. S. P., to the gallon of water, or such other disinfectant as may be approved by the Bureau of Animal Industry.

Dr. V. A. Moore: As a member of the Committee I wish to recommend that this report, as it is unanimously adopted by the Eastern Live Stock Sanitary Association, be referred to the Executive Committee of this Association; that it be printed and distributed among its members, and that after a careful consideration some action be taken.

Dr. Devine: On looking over that set of resolutions you will see that it involves a good many questions of great importance to various states. It is one of the most important things that is to come before the Association, because it has to do with the shipment of stock, in which live stock men and laymen are interested. I think it is a thing that should receive careful consideration, and that we should have advice and counsel from various sources, and I heartily second Dr. Moore's motion to have it printed and distributed.

Dr. Marshall: Mr. President, I attended the meetings in Columbus and in Albany in which those recommendations were adopted, and I realize that they are very important, and I agree fully with Dr. Moore's suggestion that they be referred to the Association for consideration, and I wish to emphasize the importance of the consideration. I would not be willing myself to vote today, knowing as much as I do about that. They may fit our conditions in the East—and they do, I think, to a great extent—but they may not fit conditions in the West. I think we all realize, all of us especially who are trying to enforce regulations in the various states, the importance of
having some uniform method of tuberculin testing, for instance, and certifying the veterinarian. The question that brought us together in Columbus was in reference to what kind of men we should endorse and qualify to make tuberculin tests. We found that in some states they were very lax. Men were put on those certified lists that probably did not have the qualifications that they should have had, and we wanted to make some kind of regulations to assure us that if we found a number of veterinarians on the certified list, that those men were as good men as we had in our own state; men that were competent and honest and qualified to make a tuberculin test, for instance. We thought in the East that we should furnish a list of that kind of men to make tuberculin tests, so that, for example, if I wanted to certify to a test made by one of those men in another state, that I would not feel that I was doing an injustice in doing so, or if you had certified to me that a test had been made by a certain man, that I would feel safe in accepting his test.

Now those things need careful consideration. They are the questions that will get you into trouble with your local veterinarians. You tell your local veterinarians, or other people, how to do certain things, and how to sign up, and they will tell you to go to Gehenna, or certain other places. But I think we can find some scheme for endorsing certain men in our state whom we feel will be safe, who will do the breeders justice, and who will do the buyers justice in making the test.

Now another thing is in reference to handling hog cholera work. We found that one state would not allow the use of the simultaneous method for vaccinating hogs. The breeders in Pennsylvania are handicapped badly when they want to sell hogs, in that they can not insure against hog cholera; the hogs will go to other states and probably develop hog cholera because of not being immunized properly. We want the simultaneous method, and yet we do not feel safe in using the simultaneous method in all cases. We will use it if it can be used, with certain restrictions. Now what those restrictions shall be is important for this Association to say. If we can get them so they are uniform in that what New York wants and what Pennsylvania wants will suit Illinois and Iowa and the West, our breeders will understand our purpose a great deal better, because then we will have uniform regulations instead of a lot of promiscuous requirements. So I would like to use all the influence that I can bring to bear to make you think on these regulations, and if you can not enforce the ones we have submitted, get us something that is better and safer.
Perhaps we can not adopt all of them, but let us go as far as we can toward adopting some uniform methods of handling livestock. It will be much easier for the transportation companies if they know your requirements are somewhere near uniform.

Dr. Kigin: While Dr. Marshall was talking about that certified list, I felt that if that plan should be adopted, for instance, in Nebraska, and I should have one man or two men, provided there were a call made for a number of men to go, and if two men should do that testing, possibly a little criticism would be made of the Sanitary Board or the State Veterinarian by the veterinarians in that local community because another man was called in to make the test; in other words, that it would cut him out of that compensation. But that really should not be allowed to stand in the way, when we consider the importance of it. The list ought to be limited to a few men. Every state has a few honest veterinarians. I know Nebraska has, and I believe Pennsylvania has.

Now relative to uniform state regulations, I would say that the president of the Nebraska State Board is at South Omaha, and after the Board got into action he was bothered to death by the railroad companies calling up and asking about this and about that, and he referred the matter to me. There were so many people that were held up en route, that were held up in Sioux City, that were held up in Lyons, that were held up in Lincoln, that were held up in North Platte, and that were held up in McCook, that it was a constant annoyance. I have often wondered how it is that some of these railroad officials do not lose their minds with all the telegraphing they have to do in trying to straighten out these matters so that they can safely permit the shipper to go on. Along in October the Board met and decided to call upon ten states for a joint meeting, to discuss this matter and get it on the way toward possible adoption at this meeting. We thought at that time that the Sanitary Association meeting would be held in December, and therefore, as it was so close to that meeting, the different state officials and sanitary boards thought that they could not attend two meetings so close together. Therefore there was only one state that agreed to come to this meeting, and of course it was postponed. Later the stockmen had a meeting to discuss their side of it before the Board, and there was a committee appointed to draft regulations as to what they felt would be just and fair, promoting the live-stock industry instead of inhibiting its great growth. Now I am going to read the regulation that was adopted. Of course
they expected to have to take some things from this and possibly add some things to it. I might state at this time that we know we can not get uniform regulations with every state. Geographic location would require different regulations in Montana, Wyoming, on the range, because the conditions would not fit Iowa, Illinois, Michigan and states of that kind. I was on this Committee representing the Sanitary Board. Following are the resolutions.

"Horses, mules, and asses: Health certificates, including mallein tests when it is deemed necessary by the State Veterinarian. Quarantine will be rigidly enforced when disease is found to exist.

"Cattle: For dairy or breeding purposes, over six months old, health certificate, including tuberculin test. For feeding or grazing purposes, except pure-bred, only health certificate. We recommend that the states willing to adopt uniform regulations have what is known as accredited herds, which will be tested once a year by a licensed graduate veterinarian whose test will be approved by the State Live Stock Veterinarian. Any owner found guilty of violating such regulations shall be removed from the accredited list. When cattle have been shipped interstate, and, for any reason, the Live Stock Sanitary Board or Commission or State Veterinarian deems it advisable to quarantine such shipment, in order to carry on the tuberculin test, they should be given the power. Provided, if any animals react to the test they must be shipped immediately to where they will be killed under Government inspection. Expenses incurred on said test must be borne by the owner and until same is paid shall constitute a lien on the cattle.

"Hogs: A sworn affidavit from the seller showing that they are healthy and have not been exposed to any contagious disease for at least two months previous to shipment. Hogs treated with simultaneous treatment can not be shipped under thirty days. Hogs treated with serum alone can be shipped at any time when the seller can give the above affidavit. Hogs and crates must be thoroughly disinfected before shipment. Railroad cars used for such shipments must be thoroughly disinfected with a five-per-cent solution of carbolic acid or a three-per-cent solution of liquor cresolis before hogs are loaded. Such hogs shall not be unloaded while in transit into any public stock yard. If feeding and watering are necessary it must be done in the car. No hogs intended for shipment into the State of Nebraska shall be loaded from or unloaded into any publi:
stock yards or ordinary chutes, but must be loaded from wagons and unloaded in the same manner. Hogs shipped to public stock yards for immediate slaughter where Government inspection is maintained, need no inspection."

Now those were the regulations proposed by the stockmen, and Mr. Graff was one of the members of this Committee appointed to go over those, and in defense of the accredited herd list I wish to say that I feel that that really is an injustice provided that care is not taken. It might be that some states would permit a man to enter this accredited list who would really be an imposition on innocent stock producers. We can see that side. But you can see different sides to everything; you can see the bad and the good side.

How much better it would be, and how much co-operation every Sanitary Board and every state official would receive from the stockman provided he obeyed the rule, and eliminated those tuberculous cattle from his herd. If he does that and cleans up his place, disinfects the stalls, etc., and is not permitted to send a cow or a bull across the state line after thirty days, I believe that is an injustice, but I do not feel that I am big enough and that I have brain power enough to solve this problem in a way that would be satisfactory to everybody concerned, and that would be universally accepted and unanimously adopted. But I wish this would be carried out here this morning. I want to take back to Nebraska some idea as to what this Association wants to do; what it recommends. I want to know what it would be willing to do other than that which I have read in this paper. If you have any suggestions I sincerely hope that you will discuss this matter here this morning in a way such that I can bring back a valuable report.

Now, as to the hog proposition. I do not know that we are ready in Nebraska to say that no hogs shall come into the state until they are treated with serum. I do not believe that we are ready to say that in Nebraska. There is no veterinarian, in my opinion, that can go into a man's herd and look his hogs over, and say whether they are all well. If there is an ailing hog the farmer may "kick" him up. In my opinion the veterinarian is not going to go through the herd and take the temperature of fifty or seventy-five hogs. Possibly some of them are infected, and it is just in the first stage of the disease; the farmer "kicks" them up, and when the veterinarian looks over the herd the farmer laughs up his sleeve, provided he is a dishonest and unscrupulous fellow. Now if an affidavit such as is recommended here must be given by the shipper or the owner of those hogs that the hogs are
healthy and have been healthy, and that there is no contagion on that farm, or within a given area, say within one mile of his farm, and has not been for six months past, why you have really got something better than a health certificate from a general run of veterinarians.

Another thing, if a man lives ten miles out in the country and wants to ship a boar into Missouri or some other state, he has got to call a veterinarian out there to get a health certificate on that hog. Now if he were selling another hog out of that herd a little bit later he would have to go through the same program of sending for the veterinarian, and the veterinarian does not go that distance of ten miles into the country for less than $5 or may be $10, and that eats up the profit on the sale of that hog. Now I believe that if we had this regulation requiring a man to make an affidavit as to the health of the hog it would be observed, because a man who violated his oath would know that he could be punished therefore. If our laws mean anything, they certainly can be enforced. When a man puts his signature down to an affidavit and goes before a notary public and swears that that is true, he is taking a great risk if he falsifies. If he makes a shipment that is not right into another state it could be easily traced, and he could be punished, and by the prosecution of a few people I believe we can straighten up any tendency on the part of farmers to ship unhealthy cattle. It would be more easily traced in that way than by trying to trace through the veterinarian and the hog man, etc.

The other day at South Omaha there was a meeting of about 150 stockmen before the Sanitary Board, and they recommended that the Nebraska Live Stock Sanitary Board quarantine all the states east of the Missouri River, and the states of Missouri, South Dakota, and Kansas. This matter of uniform state regulations was brought up, and there were representatives of all classes of live-stock men there, and they heartily approved and unanimously adopted these recommendations which I have read to you, and asked that I deliver this message before this Association, that Nebraska is willing to make a sacrifice, and on some points they are really willing to accept something that may not just at present be to their liking, in order to get uniform interstate regulations adopted through this section of the country.

Mr. F. W. Harding: Mr. President and Gentlemen: Before reading this statement I would advise you that the same is signed by the National Association of Pedigreed Live Stock Registers, Wayne Dinsmore, Secretary; the Breeders'
Gazette, by Mr. Sanders, its president; the American Aberdeen-Angus Breeders’ Association, by Mr. Gray, its secretary; the National Dairy Show, by Mr. Skinner, its Secretary; and the American Shorthorn Breeders’ Association, by F. W. Harding, Secretary.

The breeders of pure-bred cattle, sheep, and swine of the United States, through their pedigree registry associations, have indorsed by resolution the policy of the Federal and state authorities as to its methods for stamping out foot-and-mouth disease, and have assumed a patient and waiting attitude pending the successful results of quarantine and slaughter.

In view of the number of outbreaks which have occurred in the recent past, we believe it too much to expect that no more outbreaks are to occur; therefore we seek at this time opportunity for the shipment by express in crates, and by freight in clean box cars, pure-bred cattle, sheep and swine from any free area in any state to free or quarantined area in any other state.

We suggest from the large corps of inspectors who have been at work in the campaign of eradication of foot-and-mouth disease, that a sufficient number be designated and empowered to inspect all live stocks of the kinds mentioned, before shipment, and if deemed necessary to also prohibit the removal or shipment of stock from the farm receiving said shipment, for a stated period of time.

We urge your consideration of the existing fact that no branch of the live stock business is suffering the financial loss which the pure-bred cattle, sheep and swine industry must withstand through enforced non-fulfillment of orders now placed or pending. Regulations providing for intrastate and interstate shipment of live stock for slaughter obviously do not furnish the route for the breeder of pure-bred stock to his market. Nothing short of great financial loss faces the breeder of improved stock in much of the territory of the United States except the opportunity for shipment herein asked for is granted. In turn, we pledge the utmost cooperation in the way of safeguarding the movement of these shipments.

Yesterday Dr. Melvin and Dr. Mohler of the Bureau of Animal Industry were informed in a general way of our petition. Their assistance toward a workable plan of relief is expected. Now we ask you gentlemen who are representatives of various state live stock sanitary boards to take some action at this time favorable to this threatening situation.

THE SPREAD OF DISEASE THROUGH GARBAGE.

V. A. Moore, Ithaca, N. Y.

I was requested in the fall of the year by the secretary, Mr. Ferguson, to prepare a paper on the relation of the diseases of animals to those of man, to be presented at the joint session. This I started to do in all good faith, as hurried and as busy as I was. I had the paper about half prepared when announcement came that the meeting was adjourned, and I was very glad indeed to stop work on this paper, and continued to leave it alone. About three weeks ago I received word that I was to present a paper at this meeting on the subject mentioned, "The Relation of Garbage to the Spread of Disease." It was impossible for
me to be here last night and I so notified the secretary, and telling him that I could not be here I did not suppose that my name would be on the program, and I did not know that it was until a few days ago, when I received the printed program. I have no formal paper, consequently.

If I may be pardoned, Mr. President, I will say just a word in regard to some experiments that were made in connection with our institution on the transmission of hog cholera by means of meat scraps, trimmings, for example, of pork roasts and pork chops when they were taken from pigs which were infected with cholera, but which at the time of slaughter did not show evidence of disease by which it could be determined. We have in New York, and I think it is true through the east where hog raising is not as great an industry as it is in the middle west, outbreaks of hog cholera more or less frequently on small farms, where the number of swine is insignificantly small from a national point of view, and we also have a great deal of cholera from garbage-fed hogs about our small cities and villages. The reason for this is one that has puzzled a great many of us that have worked on this subject more or less. Fifteen years ago this was a very acute question in New York, and we found at that time that there was a great deal of collection of garbage, including liquid garbage, swills from certain boarding houses and hotels, and that many hogs died as the result of feeding them this material. It was looked upon and diagnosed generally as hog cholera. A careful study of those cases that I had an opportunity to study convinced me that it was not hog cholera that was killing the pigs, but I could not tell what it was. It was solved, finally, by finding that it was the excess of alkali in the liquid—in the dish water—and that was traced back easily and found to be the powdered soap that was used in washing dishes. And that fact was published in the Bulletin of the experiment station, and that trouble soon stopped. Of course it did not explain everything but it explained certain of these losses.

We had in New York at another time rather serious losses from the death of hogs in which the disease was diagnosed as cholera, and where the trouble was finally found to be poison—medicines. These losses took place in state institutions where there was a hospital, and it was found eventually that the garbage from the hospital was mixed with that from the kitchen, and that it was the practice in this hospital that when the medicine was assigned to a man and was not all used, if he died or got well, the balance was thrown into the garbage can. This was taken to the piggery and fed to the hogs, and some died fromaconite poisoning and some from strychnine poisoning, and various other kinds. There have been a good many cases that have come to my notice in the last ten or fifteen years of animals being poisoned by garbage in this way. It is a matter of superstition among healthy people, to a certain extent I guess, that medicines are strange and mysterious substances, and that if there is a bottle of medicine around that they want to dispose of they do not want to put it into the stove because they are afraid of an explosion or something like that, and so they put it into the garbage can, and if that gets to the pig in the swill he is liable to be poisoned, and consequently there is a good deal of loss in the aggregate in that way.

We had a few cases, I think, where the garbage has contained a great deal of meat, and perhaps it was decomposed, and ptomaine poisoning has resulted.

Now the question of hog cholera seemed to be important and we started to make a series of investigations and experiments in which we
fed the pigs certain quantities of pork taken from pigs that we had
inoculated with cholera and that had died of cholera; that is, pigs that
were used for the virus and were killed in the very last stages of the
disease. We found that it took a very small portion of that meat to
produce cholera in a pig. Then we carried it out further and killed the
pigs before they showed symptoms of the disease, and we examined
their post-mortem and we could not find lesions—sufficient lesions to
have condemned the pig under the most rigid rules that are now in
force—and we found that a very small quantity of the scraps from those
pigs would produce cholera. We have come to the conclusion that in a
great many of these sporadic outbreaks of hog cholera the pigs have not
been taken to stock shows of any kind, nor have the owners attended
shows of any kind; and where, so far as we know, people from infected
premises have not been on the place; that it was very likely that these
scraped pork that can be easily bought on the market may come
from pigs that were infected with cholera that were killed in our large
packing houses, but that did not have symptoms sufficient to be detected
post-mortem nor lesions enough to condemn them post-mortem, but
had developed disease; and that through these scraps they were able to
transmit the disease. It is my opinion that a great deal of the spread
of cholera can be traced to that source. And of course it is in the
garbage that that is done.

Now why I was asked to speak on this question I do not know,
other than that these experiments were made and published by Dr. Birch
in our department last fall and Mr. Ferguson was acquainted with that
publication, and I do not know whether he had anything else in mind
that I should say on this subject or not, but this is all that I have.
I do believe that if we are going to stop the spread of cholera we must
stop the feeding to hogs of scraps of pigs that are infected with cholera.
We have now, I think, a reason to enforce that. With the use of the
serum we are able, I believe, when it is properly used, to check the
disease in herds and save large numbers of individuals, and so swine
owners are not obliged, in order to save their animals, to ship them to
the market as quickly as cholera appears and have all of the exposed
and infected animals among them slaughtered at once and spread the
disease to the farms of the people that buy them. But they can be held
on the premises until they are safe to ship without further loss.

If the knowledge of the results of these investigations and the results
of the use of serum can be applied, it seems to me that the spread of
cholera can be very materially checked. (Applause.)

Dr. Connaway: Mr. Chairman, you will remember at the
meeting in Indianapolis two years ago, I think it was, Dr.
McGillivray read a paper that confirms Dr. Moore’s statements
of the danger from meat scraps. He reported the results of
experiments and observations that he had made up in Canada.
And I am glad that these dangers are being pointed out again.
But I believe that the control of this lies back at the farm, in
the prevention of hogs getting to the market. If you will look
over the Government’s last report you will find that the con-
tamination of hogs for the last four or five years has greatly
increased, runs right up, notwithstanding our production has
not increased in the same proportion. In Missouri, taking it
as a whole, something like six years before we began to spread cholera by vaccination, we had something like six million hogs to our credit. Now we are down to about the four million point. So I think the solution of this scrap business is right back on the farm: The eradication of the disease by any manner that we can. It does not matter what we apply, just so we keep these hogs away from the packing houses. I am quite sure that the packers would like to have this done, and I am quite sure that the stock yards people would like to have this done, and I am quite sure that the railroads are tired of hauling cholera hogs. And so our big problem, after all, is eradicate it on the farm.

Our good friend Dr. Torrance here and his people up there in Canada are about right on these matters: Keep it out, do not spread it by any of these vicious methods of trying to control it.
THE GLANDERS QUESTION IN CONNECTICUT.*

Frank G. Atwood, New Haven, Conn.

Mr. President and fellow members of the United States Live Stock Sanitary Association: In presenting to you the subject entitled "The Glanders Question in Connecticut," I have taken pains to illustrate this subject as it has from time to time come under my observation. The subject of glanders has been so ably presented to this Association by Dr. Mohler, Dr. Elchhorn, and others, that I shall confine myself principally to the ravages of this preventable disease reaping its victims in Connecticut, and the stupid blunders in controlling glanders, which have come under my observation.

Figure 1 shows a horse suffering from farcy which was used on a fruit wagon about New Haven, Conn. This particular case was allowed to be traded about, after I had reported it over ten weeks before as one which should be shot, and was called to my attention by the Connecticut Humane Society's agent ten weeks after I had properly reported the case to the State Commissioner on Domestic Animals. This particular

*The electrotype of illustrations for this article were furnished by Dr. Atwood free of cost to the Association.—Publication Committee.
horse, suffering from chronic glanders on the day on which the humane officer entered his remonstrance against the sale of this horse, was in public auction and the veterinary inspector for the State Commissioner had inspected the horse one hour previous to the time the Humane Society called the case to my attention, through the auctioneer. Much to my sorrow, on viewing the horse in question, I found it was the one I had asked to have shot ten weeks previous to this. After considerable delay I was allowed to take the animal and destroy same.

Figure 2 shows a chronic case of glanders discovered by one of the police officers, watering at a public watering trough. The police officer is holding up with a stick some pus which this horse sneezed and coughed out into the watering trough. It had also suffered a severe hemorrhage from its nose, this being a very advanced clinical case of glanders. This horse had been used on an ice cream wagon daily, selling ice cream in small open packages to school children. The horse standing in the same stable with this animal was also suffering with glanders and was duly reported by me.

After the horse shown in Figure 2 was destroyed, the second case in this particular stable was allowed to drift about Connecticut, neither quarantined nor destroyed and properly disposed of.

In the post-mortem on a bay gelding used on a vegetable wagon and which I reported as clinically glandered, ulcers were found on one side of the septum nasi which had destroyed nearly all the mucous membrane. This horse was taken to a man's farm and shot a few rods
from his dairy barn where the milk cows were allowed to walk in the yard, and when I viewed the same I observed flies swarming over the dead, clinically glandered horse, and from inquiry learned that this particular case had lain on the ground uncovered and not disinfected for over twenty-four hours.

When the specimen of septum nasi was collected, the farmer on whose ground the horse was to be buried had not been properly notified and after the specimen was taken and placed in the proper solutions, I asked that the horse be immediately attended to, in the interests of public health.

In another case a bay cob was shipped from New York City to New Haven with several others, all of which I had reason to believe were suspicious cases of occult glanders. From this horse blood was collected and submitted for examination. The sero-diagnosis for glanders was positive, all of which was reported to the Commissioner on Domestic Animals. He took no steps to properly dispose of the case and the owner at a later date turned the case over to me and I took a veterinarian, who held an autopsy and allowed me to make photographs and prove my clinical diagnosis.

Figure 3 shows three horses which died and were found on the bank of a stream of water which flows into a public reservoir. One of the neighbor’s dogs had suffered from a diseased mouth and another neighbor’s dog had come into the kitchen with the tail of a dead horse. I received a telephone message to come and investigate the case. I took the matter up with the health officer and further inspected the horses and stable from which those shown in Figure 3 came, and found a bay gelding named “Blaze,” white face, suffering from chronic glanders, which was reported by myself and others to the Commissioner on Domestic Animals, but was not properly attended to.
One of the records found on file in the office of the Commissioner on Domestic Animals certifies that a grey gelding was suffering from acute glanders, owned by Willis Stevens, East Wallingford, Conn., and used on a milk wagon going to New Haven daily. In the certificate the veterinarian stated that he had had this white horse killed and buried. Twelve days after viewing this certificate I photographed this particular case still alive in the cow stables of Willis Stevens, East Wallingford, Conn.

Figure 4 shows a collie dog suffering from a diseased mouth after feeding on horses which had died of glanders and had not been properly buried.

On physical examination I found that the horse (known as the Stevens' white horse) was not suffering from glanders; he had a sliver which had punctured the naso-lachrymal duct and had caused an abscess. I removed the sliver and treated the parts, also took several samples of this Stevens' white horse's blood, submitting them to three different laboratories, with a request for the sero-diagnosis for glanders. All of these laboratories reported negative, thus supporting my clinical diagnosis in a case in which the State Commissioner on Domestic Animals had received a certificate that the horse was killed and buried, suffering from glanders.
Fig. 5.

Figure 5 shows glanders of the face in the case of a veterinary surgeon who was a citizen of Connecticut and practiced in New Haven, dying of glanders in October, 1911.
Figure 6 shows a black gelding suffering from farcy, on which I held a consultation with another veterinarian, this case having been taken from the hospital of the veterinarian who died from glanders, shown in Figure 5. In Figure 6 will be observed the discharge from the inside of the left hind leg of this horse, which was diagnosed and treated as an abscess by the veterinarian who died from glanders shown in Figure 5. Serological tests proved this case to substantiate our clinical diagnosis that it was glanders.
Figure 7 shows a case of glanders in man. It will be observed in this photograph, which I took about one week before this man died, that his right leg is very much emaciated and his left leg is very much swollen and covered with farcy sores.
Figure 8 shows the same case of human glanders as shown in Figure 7. It will be observed in this photograph that the left arm is very much emaciated, while the right one is swollen and covered with farcy sores.
Figure 9 shows a larger view of the same case of human glanders shown in Figures 7 and 8, this picture having been made by an artist from the Yale Medical School.

A case of human glanders came under my observation while I was in the medical department of the United States Army. This case was diagnosed at first as syphilis and from the hypodermic use of mercury I observed marked improvement. A guinea-pig test was made and it was found that the young man was suffering from glanders and not syphilis. At a later date the disease took on an acute form, from which the young man died.

Having had the subject of human glanders brought to my attention by a physician who was a student at the Yale Medical School at the same time I was—seventeen years ago—and who knew that I had made
a special study of infectious diseases which are transmissible from domestic animals to human beings, he telephoned me regarding a case of glanders in a human subject in which the secretions had shown a positive reaction to the guinea-pig test as applied by Dr. M. R. Smirnow of the Yale Medical School, who also isolated the *Bacillus mallei* from the same case.

I furnished the physician in charge of the case a mixture of mercury and serum. From hypodermic injections of this mercury and serum and freely opening and applying alcohol to the farcy sores, the young man showed improvement, this being in the summer of 1912. The serological test was applied to this human case of glanders. Both the complement fixation and agglutination tests were positive. It has now been over two years and a half since treatment and the young man has shown neither recurrence of farcy or glanders lesions, nor symptoms which would indicate that there has not been a complete cure.

![Figure 10](image)

Figure 10. A bay gelding which in December, 1911, was driven to my office by its owner, asking if I could remove an enlargement from the submaxillary bone. On examination of the horse I found several ulcers on the septum nasi, and advised the owner that it was a case of glanders. A specimen of blood was taken for serodiagnosis and ophthalmic mallein applied to the horse's eye. The photograph in Figure 10 shows the ophthalmic mallein reaction nineteen hours after application of the mallein. The horse was destroyed on the day the photograph was taken.

A second bay gelding stood in the stable with the horse shown in Figure 10. Blood was taken from this horse and submitted for serodiagnosis, and was found positive to the agglutination and complement fixation tests. This horse showed no clinical symptoms of glanders. The case was promptly reported to the State Commissioner on Domestic Animals with the request that this case and two others which I am about to show, be appraised and destroyed under the section of the law providing for such procedure.
Figure 11 shows a black gelding suffering from chronic glanders, which was the second case asked to be destroyed under arbitration. The swelling on the horse's neck shows the subcutaneous mallein reaction which was applied after blood had been taken for the sero-diagnosis. The agglutination and complement fixation tests were positive, while the ophthalmic mallein test was only suspicious, both before and after the subcutaneous mallein test, this being characteristic in chronic cases; the ophthalmic mallein should be well massaged into the eye in such cases. Clinical symptoms rapidly developed after the injection of mallein. This caused the owner to decide to have the horse destroyed, and upon autopsy both lungs were found filled with glanders nodules, although the septum nasi showed no ulcers and the submaxillary glands were not swollen until after the subcutaneous injection of mallein.

Two horses which were stabled with the horse shown in Figure 11 both gave a positive reaction to the sero-diagnosis for glanders, one showing upon autopsy very slight lesions. In fact, only by very careful observation could anyone detect any lesions. The other showed several in the lungs about the size of an English walnut.
Figure 12 shows the well marked reaction from ophthalmic mallein test in one of these horses. This horse presented scarcely any lesions upon autopsy. It is here shown for the purpose of proving that a horse which has been in a glanders environment, while only slightly infected with the disease, will often give very prominent reaction to the ophthalmic mallein test.
Figure 13 shows a black mare which gave a positive reaction to the agglutination and complement fixation blood tests and a positive reaction to the ophthalmic mallein test, showing farcy sores on the mammary gland. This case was reported by myself to the Commissioner on Domestic Animals and was the third case asked to be destroyed under arbitration. The owner advised me if anything could be done to save the mare's life he would stand the expense. I at once proceeded to have the mare properly isolated, watered in a separate pail and gave the mercury and serum intravenously in large doses. The farcy sores were treated with an antiseptic and properly healed. This was in December, 1913. After four weeks this mare was put to work delivering coal about the streets of New Haven, and on exercise showed no rise in temperature, and with the exception of a nail puncture in one hind foot has shown no illness nor further symptoms of glanders. I have reason to believe that the mercury and serum has cured this mare.
Figure 14 shows the same mare shown in Figure 13 one year later, on the coal cart with its mate, after rendering over three hundred days of valuable service since the cure. The mate, which is used on the double truck with this case, has acted as a control for a year. No further cases of glanders in this particular stable developed, the mare being watered in a separate pail for about four months; the balance of time at the same trough with the other horses.

Figure 15 shows a black gelding used on a furniture wagon, driven to my office in May, 1912. This case presented symptoms which caused
me to take a sample of blood and submit the same for the sero-diagnosis for glanders. This horse ran a low temperature when exercised, showing no clinical symptoms of glanders or farcy with the exception of the peculiar temperature and became easily tired when exercised. After the positive results to the sero-diagnosis for glanders, a second sample of blood was taken and submitted to three laboratories, all of which reported positive to the glanders test. A large dose of mercury and serum was injected, the animal placed in a separate stall and watered in a separate pail, was not worked for about eight weeks, blood was taken at various intervals of three weeks and submitted for the sero-diagnosis for glanders, which always proved positive. After the lapse of about eight weeks the horse was put to work. The photograph shown in Figure 15 was taken twenty-nine months after the serum and mercury treatment. Over two years and a half have now passed since this case was cured, no further cases having developed in the stable where this animal is kept.

In August, 1914, a bay gelding was driven to my office for examination, showing several farcy sores on its chest and abdomen, temperature 102, submaxillary glands normal, no ulcers on the septum nasi. Ophthalmic mallein was applied to the horse's left eye and a sample of blood taken for the sero-diagnosis for glanders.

Fig. 16.

Figure 16 shows the positive reaction to the ophthalmic mallein test twenty-four hours after being instilled in the bay gelding's eye. Serum and mercury were prepared and injected intravenously the following day. The farcy sores were treated antiseptically and the horse quarantined and reported to the State Commissioner on Domestic Animals. Several
weeks later the horse was allowed to do light work, having apparently been cured with the mercury and serum.

A sorrel gelding used on a milk wagon was treated during the fall of 1913 and during the early winter of 1914 for lung trouble supposed to be congestion of the lungs. I was called to the case in February, 1914, and with the use of a speculum and electric light I found two small ulcers on the left side of the septum nasi, submaxillary glands were normal, temperature 101. On exercise the horse showed peculiar breathing. Several horse dealers believed this horse was suffering with heaves. Blood was collected by myself and submitted for the sero-diagnosis for glanders, which proved to be positive. This horse was destroyed and upon autopsy showed a large number of glanders nodules in both lungs.

Figure 17 shows a sorrel mare suffering from purpura hemorrhagica. In order to satisfy the owner that there was no infection of glanders, blood was collected and submitted for the sero-diagnosis for glanders, which proved negative. After blood was taken, mallein was injected subcutaneously, Figure 17 showing the large swelling in the neck from the mallein, even though the needle and syringe were sterilized and the field for injection properly prepared. This case is shown here to bring out the unreliable results of the subcutaneous mallein test where there is mixed infection and septic bacterial intoxication even though the advanced clinical symptoms of purpura hemorrhagica have not been developed.
Figure 18 shows sporotrichosis in a horse. This illustration was taken from the Journal of Medical Research, Vol. 23. *Sporothrix* was isolated from this case by a reliable authority. This is a disease which is often mistaken for glanders, and is a disease which is easily cured by internal and external treatment with iodine.

A bay mare came under my observation which had been previously condemned as suffering from farcy, but in which all laboratory tests were negative to farcy. I made a diagnosis of sporotrichosis, placed the animal on the operating table, curetted the wounds and applied thoroughly tincture of iodine locally and gave potassium iodide internally. This bay mare made a prompt recovery and thus the destruction of a valuable animal was prevented.

A grey gelding which suffered from sporotrichosis on the inside of both hind legs and under the abdomen, was given large doses of potassium iodide internally and the parts were all laid open with a sharp and clean scalpel, using antiseptic precautions, tincture of iodine being applied to the parts twice daily. This horse made a prompt recovery and it was only necessary to keep the animal from working for a few weeks. During this time the horse was tied so he could not lie down, and a thorough disinfection of the premises was made and all harness and equipment used about this animal were properly treated. All the tests for glanders resulted negatively.

Another outbreak of sporotrichosis which came under my observation occurred among horses owned by Troop A, Connecticut National Guard. It has been the custom for this troop of state cavalry to hold field days, and during the lunch hour (according to the sergeant) the saddles were removed from the horses and many of them were allowed to roll. This was on the edge of a field adjoining forests. A few days
later the sergeant of this troop telephoned me that many of these horses were broken out with pimples and he believed they had rolled on chestnut burrs or something which had poisoned their skin during field day. The horses were put under the care of one groom and given large doses of potassium iodide internally. The pimples on the animals as they presented themselves daily, were cleaned and opened and thorough application of tincture of iodine was made to all diseased parts. There were several of these horses which presented such characteristic lesions of farcy on their skin that I believe they would have been condemned and a mistaken diagnosis given if due care had not been exercised. In this case I have reason to believe that over two thousand dollars worth of horses would have been destroyed. A perfect cure was brought about at a cost to the state of less than fifty dollars, and with thorough cleaning and disinfecting the horses have remained well and performed valuable duties for over two years.

Conclusions.

(1) I am prepared to make the bold statement that glanders can be cured in the human being in many more cases than heretofore reported in medical records, if the disease is early and accurately diagnosed and the patient kept at rest, serum and mercury being used hypodermically as the symptoms may arise. If it is possible to obtain human blood serum to be used as a vehicle to carry the mercury, it is advisable. If it is not possible, calf serum is the next best medium.

(2) The medical profession have for over half a century made remarkable cures in the human being with the hypodermic use of mercury in one of the diseases—syphilis—which belongs to the granulomatous class. I have come to the conclusion that if I were so unfortunate as to become infected with the Bacillus mallei I should use the hypodermic injection of one-tenth to one-quarter of a grain of the benzoate of mercury to each hundred pounds of weight, sodium chloride and animal serum, quantum sufficit.

(3) I find that horses can be cured the same as human beings, with this mercury and animal serum properly and skilfully applied, together with rest for the animal and surgical and antiseptic treatment of any farcy sores. I do not wish it to be understood that I recommend this in horses, as I believe all cases of equine glanders should be immediately destroyed and payment made to the owner from the state or Federal government.

It appears to me that there should be Federal and state co-operation on the glanders problem similar to that in stamping out foot-and-mouth disease. If this disease was so handled the United States could be free from glanders, and as this disease has killed a large number of human beings, together with millions of dollars worth of horses, it appears to me the Federal Government should take proper steps to eradicate this disease from the United States.

I ask that this Association appoint a committee, made up of Federal and state officials, to bring this to the attention of the Secretary of Agriculture and Congress, asking that glanders receive Federal and state co-operation in stamping out the disease, taking one of the smaller states for this work. I believe it is the proper way to try this Federal and state co-operation in stamping out a disease which belongs to a class of preventable diseases.
Dr. Dorset: Mr. Chairman, I have been very greatly interested in this paper, particularly on the stress that was laid on the danger to human beings from glanders. I do not believe that the medical profession as a whole in the country realizes at all the importance of glanders as a disease of man, and I think it would be a very desirable thing indeed, if such figures and data as Dr. Atwood has presented could be brought before the medical profession. I have been very greatly interested in the matter and think it is of great importance.

LIVE STOCK IMPORTATION PROBLEMS IN THE PHILIPPINES.

Archibald R. Ward, Washington, D. C.

The Philippine Islands do not produce sufficient live stock to supply local needs for beef and for work animals. Rinderpest has swept the Islands from time to time inflicting enormous damage, hardly calculable when all the indirect losses are considered.

The Census of the Philippine Islands states that during a great epizootic of rinderpest in progress during 1902, 629,176 cattle and carabaos (water buffaloes) died. This is estimated as 43.1 per cent of the number in existence the previous year. Figures for the period immediately previous to 1902 are not available, but there was an excessively high death rate. The census report considers that the figure 42 per cent, the estimated mortality among carabaos, represents about half the rate that would have been shown for the entire period of the pestilence. The census places a value of $36.12 U. S. currency per head upon all the cattle. With this as a basis the figures indicate a loss during 1902 of $22,725,837. Approximately exact estimates of the monetary losses from rinderpest in the epizootic in question must stop here. However, since the carabao is the chief work and draft animal, many branches of agriculture are almost wholly dependent upon this animal. The indirect loss due to the effect upon agricultural production was enormous, but hardly calculable.

The date of the original importation of rinderpest into the Philippine Islands is not definitely known, but there is abundant information to controvert the statement that it occurred during the American occupation. For instance the writer has consulted a pamphlet on the disease published by the Civil Government of the Philippine Islands in 1888, which states that the last epizootic occurred in July, 1887, in the Provinces of Pampanga and Manila.

(1) Census of the Philippine Islands, 1903, vol. 4, p. 227.

On the fourth cover page, the publication is further described as follows:

NOTA

Esta cartilla ha sido extractada de la Memoria, titulada: “Una Epizootia en Filipinas,” y se publica de orden de la Dirección general de Administración Civil.

OTRA


207
Steam plows do not afford a remedy in lessening the demand for draft animals, except in the case of one or two sugar plantations under the most progressive, enlightened management. The conditions under which rice, the principal product, is grown are quite different, as the plowing must be done in paddies. These are small areas of land, surrounded by irrigation levees to permit flooding. In preparing the land for planting, the rice paddies become mere mud puddles. The carabao is the only draft animal capable of wading about in the mud and exerting a useful tractive effort. Furthermore, the bulk of the cultivated land is in small holdings and those of one individual are usually widely scattered.

The carabao thus seem to be indispensable in growing the principal crop, and together with draft cattle are of equal importance in moving crops to market. Horses are an insignificant factor in heavy hauling. The native pony is small, and the numbers are kept down by deaths from surra. In some provinces horses cannot be kept on account of this disease.

While at times the demand for the importation of work animals has undoubtedly been legitimate, during the time that the writer was familiar with conditions, doubt arose in some cases as to the real necessity for their importation. I refer to the tendency of a cattle trade once established, to continue. For instance, Northern Luzon was producing a surplus of carabao. Nevertheless, residents of other portions of the Islands would not buy them, preferring those from French Indo-China. Thus, an insistent demand from the Province of Iloilo for draft animals could not be satisfied by shipments from the Province of Ilocos Norte, as was actually tried by dealers. It merely had been the custom in Iloilo to use foreign animals.

As regards importation of meat, the needs of the American and other foreign residents of the Islands were, during the period of 1910 to 1914, being completely supplied by the importation of frozen meats from Australia. It is understood that the war has altered the situation by reducing the number of ships provided with refrigeration facilities.

Filipinos demand freshly slaughtered beef, believing that the frozen product lacks flavor. Most of us can recollect when similar objections were made against frozen or chilled beef in the United States, in favor of the locally slaughtered products. In consequence of this prejudice, there always exists an insistent demand from consumers for the importation of beef on the hoof.

The most convenient foreign source of cattle and carabao is offered by the eastern mainland of Asia, in which territory rinderpest and foot-and-mouth disease are enzootic.

Certain characteristics of rinderpest involving difficulties of diagnosis as related to the problems of importation, deserve emphasis. Descriptions of the disease as observed in western Europe, where it has in recent times existed only as an introduced pest, propagated among susceptible cattle, by no means are characteristic of the same disease where it is enzootic. The statement has been made at various times by cattle importers and others that rinderpest is an easily recognizable disease, and that consequently a short quarantine period for imported animals should suffice to protect against the introduction of the disease. However, the truth of the matter has been known a long time, as attested by statements found in the Transactions of the Second Inte-

national Veterinary Congress held at Vienna in 1865. The author of the statement is Professor Jessen, the delegate from Russia, and is of interest as showing the views on the quarantine period of a man familiar with the disease in a country where rinderpest had long existed. Jessen’s remarks state the case so nicely and have been so abundantly confirmed that they are herewith quoted:

"I have already directed your attention to the fact that in accordance with experience, the appearance of the disease does by no means invariably indicate its commencement; but that, especially in steppe cattle, where the rinderpest generally, but not always, appears in a mild form, the disease may be overlooked during several days, and that the day on which the first symptoms appear is considered the termination of the incubation period. As yet experience points to the ninth day, and I must confess I have not observed a commencement of the disease later than the ninth day. In this respect, a quarantine period of ten days therefore seems amply sufficient. But to this, Gentlemen, is added an evil, which overthrows the whole quarantine system, and which we ought to consider, especially on behalf of those veterinarians who are appointed to quarantine establishments on the borders, where steppe cattle pass into countries without steppes. I have always asserted, and here repeat the assertion, that I at least, after the most careful examination, will never maintain with certainty that a herd consisting of 10, 200, 300 or 1,000 head of cattle from the steppes, on entering the quarantine establishment, is perfectly sound; neither do I dare conscientiously to assert that it will leave the establishment in perfect health, no matter whether it has been there ten or twenty-one days. Because experience has taught me that the rinderpest may appear in the steppes in such mild form, that no veterinarian, be he ever so experienced, will be able to recognize it. I am convinced that even with a quarantine period of twenty-one days the disease might be communicated from animals only slightly sick, or where the disease is not at all discernible, to others who would carry the malady with them from the quarantine establishment."

Similar observations regarding the mildness of symptoms of rinderpest have been recorded by Littlewood in Egypt; by Rickmann in German South West Africa; by Eggbrecht, in Kiao-Chau; by Baldrey and by Oliver, both in India, and by Bauche in French Indo-China. Keylock gives a striking description of the condition of China as regards rinderpest as follows:

"It may be interesting to mention that the disease is, as far as can be gathered, indigenous to the whole of China; it is continually smouldering in the country, and, with absolutely no preventive measures to arrest its spread or action taken to eradicate the disease, it seems extraordinary, considering the mortality of the disease, that there should be any cattle left in China."

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(1) Jour. Comp. Path. & Therap., vol. 18, No. 1, p. 312
(6) Bauche. Rapport sur une Epizootie de Peste Bovine dans la Province
He then points out that cattle are kept isolated in small herds and are not used as beasts of burden or traction. Further on (p. 205), he writes:

"In this part of China (Shanghai) whenever one gathers together twenty or thirty head of cattle, cattle plague (rinderpest) will certainly break out amongst them."

Of the various possible shipping points on the eastern coast of Asia, the British Colony of Hongkong is the most convenient source of cattle for importation into the Philippines. It is located about six hundred miles northwest of Manila, and the two ports are united by a thoroughly established trade route of long standing.

The colony of Hongkong consists of a mountainous island, together with a few hundred square miles of rocky barren mainland. The territory is incapable of supporting any considerable number of live stock. Therefore, all cattle shipped from Hongkong are not to be considered as having been raised under sanitary supervision of British colonial veterinary officers, but the animals originate in various points in the interior of China tributary to that port.

The sheds in the cattle depot in Hongkong are for the most part sanitary and the veterinary supervision efficient. However, under the conditions, it is to be expected that rinderpest and foot-and-mouth disease infection will both be present when those diseases are prevalent in the territory tributary to that port. In general the cattle originate in China, but some come from French Indo-China. Both rinderpest and foot-and-mouth disease have been apparently propagated in the Hongkong cattle depot at times, as reported by Shealy.

The conditions as regards these diseases in the interior vary from time to time and are not investigated by the Hongkong officials other than through observations on the cattle after arrival. No restriction is placed upon the shipment of diseased animals to Hongkong, as it has practically no animal industry interests to be protected. If animals are infected and die, it is a matter of no significance to the local officials, other than that they prevent the slaughter for food of those showing a fever or visible symptoms.

There is no disposition on the part of the local British veterinary authorities to deny the existence of the conditions described. They simply cannot guarantee that the depot will remain free from infection.

It is a matter of common knowledge that certainly as far back as the beginning of the American occupation of the Philippines the cattle trade with Hongkong was an extraordinarily important factor in the dissemination of rinderpest and foot-and-mouth disease in the Islands.

Exact figures are available concerning the existence of foot-and-mouth disease and rinderpest in shipments to the Philippines from Hongkong during the period from July 5, 1909, to December 2, 1910, as shown by inspection after arrival in Manila. One hundred and seventy-three shipments, comprising 18,321 head of cattle, were imported. The observations, covering a period of approximately eighteen months, may be summarized as follows:

Shipments infected with foot-and-mouth disease...110
Shipments infected with rinderpest............... 5
Shipments infected with both diseases............ 8
Shipments designated as “exposed”................. 26
Shipments in which no disease was recognized....24

The group of shipments designated as “exposed” arose because of the fact that during the period July 5, 1909, to June 1, 1910, no authority existed for subjecting to quarantine shipments of live stock from Hongkong, or to prevent the landing of infected live stock. However, Act 1760 of the Philippine Commission conferred authority to quarantine cattle when infected or when in the judgment of the Director of Agriculture they had been exposed to disease. Therefore, during the period mentioned all shipments that were not recognizably diseased, after being landed, were regarded as exposed and were quarantined. How probable this assumption was, is shown by the fact that of the 26 shipments tabulated above as exposed, 23 shipments did later develop foot-and-mouth disease, one rinderpest, and one both diseases. Only one shipment of those held on suspicion, failed to confirm the necessity for the measure in question.

Thus, more than 85 per cent of the shipments from Hongkong during this period of eighteen months were infected with foot-and-mouth disease or rinderpest.

Figures for neither disease are considered as fully representing the true percentage of these shipments capable of conveying disease. Rinderpest, as it exists among Asiatic cattle, is particularly liable to exist in a mild form which defies detection. Besides, the cattle importers practiced the injection of anti-rinderpest serum just previous to shipment. This, as shown by Ward and Wood, would tend to mask the symptoms of the disease if present, without decreasing the capacity of the animals to transmit infection.

On June 1, 1910, General Order No. 15 of the Bureau of Agriculture became effective. This provided, so far as Hongkong is concerned, (1) that infected shipments discovered on shipboard be removed from the Philippine Islands without unloading, and (2) that apparently healthy animals from ports declared infected could be transferred to lighters and could be landed only ten days after shipment from the foreign port. As three days were consumed in transit, it meant that animals could be held for a week in Manila on lighters before landing. In case of disease being discovered during quarantine, the animals were to be held upon the lighters until ten days after they had been apparently free from disease.

Simultaneously with this, the ports of Hongkong, Amoy, Shanghai, and other ports along the Chinese coast, either on the mainland or adjacent islands, were declared by the Director of Agriculture to be infected ports.

Thus, during the period from June 1, 1910, to December 2, 1910, which is included within that to which the foregoing figures apply, importation was carried on under comparatively severe restrictions, inasmuch as shipments found infected on the steamer must be returned to Hongkong on the same steamer. It is interesting to note that of the twenty-three shipments arriving during this period, only two were infected.

each developing both rinderpest and foot-and-mouth disease only after transfer to lighters.

Some of the schemes adopted by cattle importers are of interest as indicating the difficulties encountered by the Government of the Islands in attempting to protect against the importation of infectious diseases. The following certificates signed by a veterinarian in the employ of the cattle importer to protect his interest were submitted to the Bureau of Agriculture of the Government of the Philippine Islands along with imported lots of cattle. It should be noted that the Government did not require such a certificate and on the contrary disapproved the practices stated in the certificates. Nevertheless, the papers in question were naively submitted by the Filipino importer as commendable and reassuring evidence:

**To Whom it May Concern.**

**Hongkong, November 22, 1910.**

This is to certify that the (33) thirty-three head of cattle shipped today per S. S. KAIFONG by Messrs. F. S. Dizon & Co. were inoculated with anti-rinderpest serum before shipment, as well as having recovered from an attack of foot-and-mouth disease.

(Signed) ....................
Veterinarian.

**To Whom it May Concern.**

This is to certify that the twenty-one (21) head of cattle shipped today per S. S. LOONGSANG by Messrs. F. S. Dizon & Co. were not exposed to either foot-and-mouth disease or rinderpest for a period of ten days before shipment from Hongkong; also they were inoculated with anti-rinderpest serum.

Hongkong, 26th November, 1910.  
(Signed) ....................
Veterinarian.

Thus is presented evidence of the administration of anti-rinderpest serum shortly before shipment of the cattle. This at best could only mask the symptoms of a disease which without such a confusing factor would have been difficult enough to recognize.

Further, we are given the disquieting information that possibly no more than ten days had elapsed since exposure to foot-and-mouth disease in the case of one shipment, and that the other shipment had been infected. Neither statement carries conviction of freedom from danger of foot-and-mouth disease.

As a matter of fact, both shipments developed rinderpest and foot-and-mouth disease while in quarantine on lighters in Manila Bay.

These shipments brought about the establishment of a ninety-day quarantine from date of shipment, by authority of General Order No. 18, dated December 10, 1910, effective December 20, 1910. This effectually prevented the introduction of disease from Hongkong, for no cattle were imported under the conditions required.

Subsequently, under the terms of General Order No. 4, Series 1911-12, under date of November 8, 1911, the terms of the above-mentioned General Order were modified with respect to animals immunized against rinderpest by simultaneous inoculation. Opportunity was offered importers to have the animals immunized before shipment by a veterinarian of the Philippine Government, at the owner's expense. The order provided for withholding permit for importation of animals in case of the appearance of any other dangerous communicable animal disease. In view of the condition of Hongkong with reference to foot-and-mouth...
disease, and the expense that was feared, cattle dealers did not consider the prospect attractive. The matter was taken up twice by dealers in a desultory manner and preparations progressed to the extent of sending a veterinarian to Hongkong, but no importations of consequence resulted.

The method of immunization proposed had at the time not been extensively tested, but has since been extensively employed, both on recently imported animals and others.

In point of convenience of location as regards furnishing live stock for importation into the Philippines, the Kingdom of Cambodia, French Indo-China, stands next to Hongkong. For instance, during the fiscal year ending June 30, 1908, there were 16,600 head of cattle and 1,750 head of carabaos imported from the ports of that country. Records available to the writer concerning the condition of shipments from that country date back to August 7, 1908. From that date until June, 1911, only one infected shipment—foot-and-mouth disease—was recognized.

Beginning with the period June 11, 1911, there arrived in the Philippine Islands from the port of Pnom Penh, Indo-China, infected shipments of cattle and carabaos as follows:

<table>
<thead>
<tr>
<th>Date of Arrival</th>
<th>Steamship</th>
<th>Cattle</th>
<th>Carabaos</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 19, 1911</td>
<td>Shing Shung</td>
<td>328</td>
<td>...</td>
<td>Rinderpest</td>
</tr>
<tr>
<td>June 22, 1911</td>
<td>Solstad</td>
<td>244</td>
<td>402</td>
<td>Rinderpest</td>
</tr>
<tr>
<td>June 28, 1911</td>
<td>Spir</td>
<td>451</td>
<td>9</td>
<td>Foot-&amp;-Mouth</td>
</tr>
<tr>
<td>June 30, 1911</td>
<td>Binh Thuan</td>
<td>129</td>
<td>209</td>
<td>Foot-&amp;-Mouth</td>
</tr>
<tr>
<td>Nov. —, 1911</td>
<td>Shing Shung</td>
<td>refused landing</td>
<td>Foot-&amp;-Mouth</td>
<td></td>
</tr>
<tr>
<td>Dec. 23, 1911</td>
<td>Germania</td>
<td>611</td>
<td>...</td>
<td>Foot-&amp;-Mouth</td>
</tr>
<tr>
<td>Apr. 6, 1912</td>
<td>Binh Thuan</td>
<td>451</td>
<td>...</td>
<td>Foot-&amp;-Mouth</td>
</tr>
<tr>
<td>Apr. 24, 1912</td>
<td>Binh Thuan</td>
<td>490</td>
<td>115</td>
<td>Foot-&amp;-Mouth</td>
</tr>
<tr>
<td>Apr. 30, 1912</td>
<td>Ulv</td>
<td>447</td>
<td>175</td>
<td>Foot-&amp;-Mouth</td>
</tr>
</tbody>
</table>

It will be seen, referring to the above capitulation, that during the month of June, 1911, five shipments arrived in the Philippines from Indo-China affected with foot-and-mouth disease. As this was a very dangerous matter and threatened to spread disease to animals in the Philippines, the importation from Indo-China was temporarily suspended until arrangements could be made insuring, if possible, the importation of clean shipments. In accordance with previous authority obtained from the Honorable, the Secretary of Public Instruction, a veterinarian of the Bureau of Agriculture was sent to Pnom Penh on July 29, 1911, to confer with the representatives of the Government there relative to the prevalence of contagious animal diseases in an endeavor to arrange a system whereby healthy shipments of cattle and carabaos could be imported into the Philippine Islands.

The veterinarian sent to Pnom Penh proved to the satisfaction of the Resident Superior that foot-and-mouth disease existed in that port. Arrangements were made for holding export shipments on an isolated island in the Mekong River for ten days under the observation of French colonial veterinarians.

It was agreed by the Resident Superior that a certificate should accompany each shipment to the Philippine Islands signed by the veteri-

narian inspecting the shipment and approved by himself stating that the animals had been submitted to a period of observation for ten days on an island or in a quarantine station and that they had been visited three times by a veterinarian.

While in Indo-China this veterinarian of the Bureau of Agriculture certified to two shipments of cattle and carabaos which arrived in the Philippines free of disease. At the consummation of his agreement with the French officials he returned to Manila. All succeeding shipments received a clean bill of health from the French authorities.

During the period from October 13 to December 4, 1911, inclusive, six clean shipments arrived in the Philippines from Indo-China. In November, 1911, the steamship "Germania" arrived from Pnom Penh with a shipment of cattle and carabaos which were found to be infected with foot-and-mouth disease on arrival. In accordance with the provisions of paragraph 1, General Order 15, above mentioned in connection with importations from Hongkong, the shipment with all effects pertaining thereto was removed from the Philippine Islands.

On November 18, 1911, General Order No. 6 was published. This order provided for inspection of animals in Cambodia by a veterinarian of the Bureau of Agriculture and permitted the landing in the Philippines of any animals certified as healthy by him.

The importers of live stock from Indo-China requested that two veterinarians of the Bureau of Agriculture be sent there to certify to shipments of animals for the Philippines. This request was complied with and two veterinarians proceeded to Pnom Penh on November 21, on the S. S. "Germania," which ship was returning to that port with the infected animals which had been refused permission to land. These men were instructed to exact any conditions necessary and to hold the cattle any length of time that they desired before issuing a certificate of health.

On the next trip of the S. S. "Germania" to Manila with cattle and carabaos, arriving on December 23, 1911, infection was found among the animals, notwithstanding the ship had been thoroughly disinfected. However, as the shipment was accompanied by a certificate signed by a veterinarian of the Bureau of Agriculture, authority was given for the landing of the animals in accordance with the provisions of paragraph 2, of General Order No. 5, referred to above.

After the date of this shipment up to and including March 18, 1912, twelve shipments of cattle and carabaos were brought into the Philippines from Indo-China certified to by the veterinarian of the Bureau of Agriculture, and infection was found in none.

One of the two veterinarians sent to Pnom Penh on November 21, 1911, returned to the Philippines during February, 1912, leaving only one Bureau of Agriculture representative at that port. He was relieved in March and another veterinarian sent to take up his duties there. Before leaving Pnom Penh for Manila this veterinarian certified to the health of a shipment of cattle and carabaos on the S. S. "Binh Thuan." He embarked on the same steamship for Manila and during the voyage he discovered that the shipment was infected with foot-and-mouth disease. However, under the provisions of the General Order mentioned above the animals were permitted to land. The animals in this shipment had been inspected at three different times before they were loaded at Pnom Penh, which goes to show how difficult it is to insure the securing of animals free from infection at that port.
Following this infected shipment, two shipments accompanied by certificates bearing the signature of the Bureau of Agriculture veterinarian there arrived free from disease.

On April 24, the S. S. "Binh Thuan" arrived at Manila with a shipment of cattle. Upon landing one of the animals was prostrate, and on the morning of April 25 died on shore, after which a post-mortem examination revealed well-marked lesions of rinderpest. The whole shipment was then placed in the Pandacan quarantine station. Four cripples, which were slaughtered, were found on post-mortem examination to be infected with rinderpest. The S. S. "Binh Thuan" called at Iloilo on April 20, 1912, while en route to Manila and 402 carabaos were disembarked at the Iloilo quarantine station. This was before rinderpest infection had been identified, although animals were sick, showing obscure symptoms. Later, 138 of these animals died of rinderpest.

On April 30 the S. S. "Ulv" arrived in Manila with a shipment of cattle, which was landed on arrival. Three of these animals on post-mortem examination showed rinderpest lesions.

About this time severe outbreaks of rinderpest were occurring in two provinces on the Island of Panay that had received animals from the Iloilo quarantine station, as well as in two provinces on the Island of Luzon, in close proximity to Manila. Previous to the arrival of these two infected shipments, the greater part of the animals brought in from Indo-China were sold by the importers to agriculturists in the provinces in which the rinderpest mentioned above occurred. None of the Indo-China animals in these earlier shipments were subjected to a post-mortem examination, nor showed any outward symptoms of rinderpest, but there is little doubt that many cattle and carabaos brought into the Islands introduced this disease, although in a very mild form and not easily discernible.

In view of these existing conditions it became necessary on June 25, 1912, to publish General Order No. 8, requiring a ninety days' quarantine before allowing cattle and carabaos imported from Indo-China ports to be landed in the Philippines. Since the publication of this order, with the exception of the animals ready for shipment at the time of publication of the order, no more shipments were brought into the Philippines from Indo-China until February, 1914.

During November, 1912, a Bureau of Agriculture veterinarian was sent to Pnom Penh prepared to establish a simultaneous inoculation station at or near that port for the purpose of immunizing cattle and carabaos destined for the Philippine Islands. This measure had been decided upon as the only safe one that would insure the importation into the Philippines of cattle and carabaos free from rinderpest. This method had been agreed to by the importers, who were ready to erect the necessary buildings and furnish such supplies as might be required for immunizing purposes. The matter was taken up fully with the authorities of the government of French Indo-China by the Bureau of Agriculture veterinarian, but as the authorities in Pnom Penh would not consent to simultaneous inoculation at that place, no agreement was reached. The offer of the Philippine Government to allow importation after immunization in Cambodia, however, remained in force.

The impasse occasioned by the attitude of the officials of French Indo-China was broken by the promulgation of a general order on January 1, 1914, which permitted simultaneous inoculation of animals
from that country in the Port of Iloilo. Previously the area available for quarantine purposes in Iloilo was accessible only by driving imported cattle over public roads for about a mile. The acquisition of a quarantine station in an isolated location on the water front improved conditions somewhat and consequently the order above referred to was issued to satisfy an imperative demand for work animals by the sugar planters on the islands of Panay and Negros. Private information received by the writer from his successor in Manila, Dr. Stanton Youngberg, is to the effect that up to December 14, 1914, over 1,900 carabaos had been immunized with a loss of only twelve animals. Only about 47 per cent of these animals had sufficient susceptibility to rinderpest to show a thermal reaction when injected with serum and virulent blood. The inference is that rinderpest infection is common in the district in French Indo-China from which the animals came.

The present war has further complicated the live stock importation problem by reason of a threatened shortage of meat, due to the embargo on the exportation of foodstuffs from Australia. Consequently, on September 19, 1914, General Order No. 34 was issued, which permitted the landing in Manila for slaughter only, of cattle from French Indo-China. The cattle are transferred in Manila harbor from ships to lighters, which are towed up the Pasig River for about a mile and discharged in the Pandacan quarantine station. The animals are slaughtered in the quarantine station and the meat is consumed largely in Manila.

When the measures were taken in the spring of 1910, looking to the closing of the port of Hongkong as a source of supply for cattle on the hoof, a cattle trade with Australia came into existence to meet the demand for freshly slaughtered beef. Regular steamship routes connect Manila with the ports of eastern and southern Australia, but the accommodations for cattle are inadequate and these steamers do not tap the territory where range cattle are cheapest. The port of Wyndham on the northwestern coast of Australia drains a cattle country so isolated from the rest of the continent that the Philippine Islands afford the best market. This port is only eight days distant from Manila by slow steaming cattle ships. The cattle in the territory tributary to Wyndham are infected with contagious pleuro-pneumonia, and it was from this port that infected cattle were introduced into the Philippines. The details concerning the importation of infected shipments need not be presented here, for the circumstances have been described elsewhere. One shipment of 398 head showed 9 per cent infected, and another of 262 head showed 6 per cent infected.

As the Philippine Islands were certainly not infected with this disease, the shipments to the provinces were followed up carefully and such precautions taken that the infection did not escape. General Order No. 16, under date of July 19, 1910, stopped cattle importation from Australia by imposing a ninety-day quarantine.

As a result of the clamor to have an investigation made to ascertain if healthy cattle could be obtained from Australia, Dr. F. C. Gearhardt, a representative of the Bureau, was sent there to report upon conditions. Some of the details regarding his investigations have been reported by

the writer. 

In short, the information received was to the effect that from nowhere in Australia could range beef cattle be obtained that were absolutely free from the danger of carrying contagious pleuro-pneumonia. Dairy and breeding stock could be obtained under very strict precautions, exercised with the assistance of Australian veterinary officials.

Nevertheless, strong agitation was set afoot to have permission granted for the importation of cattle from northern Australia for slaughter in an isolated establishment on the shore of the bay, near Manila. This was satisfied by the issuance of Executive Order No. 25, of the Governor General, under date of May 20, 1911, which provided for a committee to select a site for an abattoir. Following the report of the committee, General Order No. 2, series of 1911-12, under date of July 26, 1911, permitted the importation of live cattle from Australia for slaughter in quarantine.

From the opening of the abattoir until December 31, 1913, there were slaughtered 21,113 head of cattle and the meat inspection statistics for the same period show 1,658 condemnations of carcasses or parts, for contagious pleuro-pneumonia. In the case of this disease, these condemnations indicate an equivalent number of animals visibly infected. Thus, 7.7 per cent of the animals showed the disease.

Further, practically all of the animals slaughtered showed the presence of the worm nodules caused by Onchocerca gibsoni. This parasite has been described by Gilruth and Sweet, but its life history is not completely known.

While the nodules are admittedly of no significance to public health, they cause disgust to the consumer of beef, and in consequence they constitute a serious problem in Australia. Beef showing these nodules is prohibited landing in Great Britain, and the writer is informed that this prohibition is met by the removal of certain superficial muscles. The slaughter of Australian cattle in the Philippines certainly exposes the local cattle to risk of infection by the parasite.

The same Australian cattle dealer who ships the stock to Manila for immediate slaughter has exerted persistent pressure for permission to import cattle for stocking a range in the northern part of Mindanao, the second largest island in the Philippines group. While the matter has been perilously near a wrong decision several times, at last report this permission was still withheld.

The city of Manila furnishes a demand for the importation of a few milch cows each year for local use. Therefore, in accordance with the report to the effect that healthy cows could be obtained in southern Australia, a general order was issued providing for importation of animals accompanied by a certificate of health from officials of the commonwealth of Australia. While animals from southern Australia are susceptible to Texas fever, they usually escape attack in Manila because they are isolated in stone paved courts and are not pastured. The importation of this class of stock only averages 125 head a year.

From time to time cattle dealers have responded to the pressure induced by prohibition of importation through common channels and have proposed to import shipments from various uncommon sources,

which has necessitated investigation of local conditions by the Bureau. Formosa furnished a few cattle, but the existence of foot-and-mouth disease and rinderpest there prevented any extensive trade. One shipment of cattle and carabaos came from the Portuguese territory in the Island of Timor. The country is too unsettled to permit judging of animal disease conditions, and the venture was commercially unprofitable. The one shipment imported was interesting in that the cattle were of the species *Bos banting*, which is noticeably different from the common species of cattle in Europe and in Asia, respectively. One shipment of cattle came in unexpectedly from the French Island of New Caledonia. At present all importations from countries not mentioned in Philippine cattle importation regulations must be reported to the Bureau of Agriculture, and permission to import must be obtained before shipment.

Shipments of cattle from the United States have not been made recently, for they encounter the hazard occasioned by the presence of cattle ticks in the Philippines. Further, all cattle accustomed to temperate zone conditions find in the tropical climate very unfavorable conditions.

The cattle importation regulations of the Government of the Philippine Islands are thus seen to involve a complicated set of demands which seem utterly irreconcilable to a person on the ground and subjected to the pressure that they invoke.

No question exists as to the harmfulness of introducing the infection of foot-and-mouth disease into the Philippines. The ravages of the disease in the islands fall short of that of the disease in temperate climates only in that practically no dairy industry exists there.

As to rinderpest, Baldrey has advanced the idea that a foreign strain of the disease can set up a destructive outbreak in localities where the animals are tolerant to the local strain. Manila is the cattle exchange for native cattle and carabaos for most of the Philippines, as well as the important center for the importation of foreign animals. In view of the vigorous campaign against the disease in progress within the Islands when cattle importation regulations were most stringent, it seemed imperative not to yield to demands involving the importation of infection.

The precautions against importation of infectious diseases and the campaign against the same in the Islands during the period with which the writer was familiar were rapidly bringing the Islands into a condition of economic independence in the matter of live stock and beef importation. Statistics compiled in the Bureau of Agriculture show that on December 31, 1910, there was a total number of 1,026,687 cattle and carabaos. Corresponding figures for December 31, 1913, show 1,498,508, an increase of 471,821, or 45 per cent over the number in existence in 1910. Probably all the figures quoted are 20 per cent too small, for actual counts in widely separated localities have shown an average of 20 per cent more animals than were reported. It is customary among the Filipinos to evade reporting live stock in order to avoid payment of the registration fee. In any event the number of neat cattle at the close of 1913 greatly exceeded the figure given by the census as in existence in 1902 during the great epizootic of rinderpest.

The construction of a slaughter house and stockyards for the accommodation of Australian cattle immediately brought forth demands that

(1) Loc. cit.
Asiatic cattle be admitted to the same yards. Rinderpest and foot-and-mouth disease do not exist in Australia and consequently the cattle from there are highly susceptible to both diseases. The Australian cattle arrived by shiploads of six or seven hundred head and were held in the yards for slaughter daily, in accordance with the local demands of the meat trade in Manila. Had Australian cattle, already infected with contagious pleuro-pneumonia, been mixed with cattle carrying rinderpest and foot-and-mouth disease infection, the three worst cattle plagues of the world would have joined forces with but one result—the extinction of the Australian cattle.

Suggestions were made time and again that animals be allowed to be imported from the mainland of Asia for immediate slaughter, but these were uniformly denied until the European war disturbed conditions, not only because of the danger of infection from the live animals, but for fear of the dissemination of disease by meat. The virus of rinderpest may remain alive in clotted blood for five days, and thus may remain virulent in meat for a period five times as long as freshly slaughtered beef is kept by the Filipinos.

Importers anxious to have the Hongkong cattle trade resumed created agitation along the line of charging that cattle importation restrictions created a scarcity of meat for the poor. On the contrary, Australian frozen beef could be placed on the market cheaper than other foreign beef imported on the hoof. This frozen beef undoubtedly was sold as the freshly slaughtered article, and importing dealers reported a constantly increasing consumption of frozen beef by Filipinos.

Further, there was a slight demand for draft animals, greatly magnified by interested business men. The opening of the port of Iloilo to the entrance of draft animals most highly desired—carabaos from French Indo-China—has resulted in the importation of only 1,900 head of carabaos during the period of January 1 to December 14, 1914.

Owing to the unfamiliarity of the general public with the organization of the Government in the Philippine Islands, it should be noted that the activities of the various parts of the Government there are quite distinct from the corresponding branches of the Government of the United States. The Bureau of Insular Affairs of the War Department forms the only point of contact of the two governments. This explanation is made particularly in view of the fact that the erroneous impression seems to exist that the Bureau of Animal Industry of the United States Department of Agriculture is concerned with veterinary affairs in the Philippines.

Authority in cattle importation matters in the Philippines is partly vested in the Director of Agriculture, who has subordinate to him a Chief Veterinarian. The Director of Agriculture in turn is subordinate to the Secretary of Public Instruction in matters of cattle importation, and the Secretary is subordinate to the Governor General. Time and again would-be cattle importers, thwarted in their desires by regulations, have appealed their cases step by step from one official to another, with varying success.

I have aimed in the foregoing to record the main features of the cattle importation problem of the Philippines and the action taken from time to time. The period covered is chiefly that of my incumbency of the position of Chief Veterinarian of the Bureau of Agriculture (July 1, 1910, to February 14, 1914), but to give events the proper setting mention has been made of changes that occurred both under my predecessor and my successor.
The events described illustrate a painfully slow progress, with frequent setbacks, toward the ideal of absolute prohibition of importation into the Philippines of live stock from Asia, Australia, and islands adjacent to both. However, they have their illustrative value in showing what leniency in cattle importation regulations can not be allowed to shippers from countries infected with foot-and-mouth disease and rinderpest.

**INFECTIOUS ANEMIA OF THE HORSE.**

Hubert Schmidt, College Station, Texas.

Infectious anemia of the horse, also known as swamp fever, pernicious anemia, join distemper, American surra, malarial fever, typhoanemia of the horse, is a specific infectious disease of the equine family which manifests itself as an acute or chronic septicemia with a rapid destruction of the red corpuscles. Up to the present time the cause has not been demonstrated, but it has been repeatedly shown that the virus passes the pores of porcelain filters and is therefore a filterable virus. It is a hot-weather disease, usually making its appearance in May and lasting till October. It is most prevalent in low, marshy lands.

The disease is very widely spread and yearly causes tremendous losses to the stockmen. It has been observed in Mexico; is prevalent all along the low, marshy coastal plain of Texas, in Nebraska, North Dakota, Nevada, Minnesota, Colorado, Wyoming, Montana, and in Canada, especially in Manitoba. Furthermore, it is found in Hungary, France, Lorraine, Switzerland, and probably in Sweden.

All attempts to demonstrate the virus microscopically have failed; likewise all attempts at cultivating the same. The virus is present in the blood, the urine and feces of the affected and also of the apparently recovered animals. The disease may be easily produced artificially by intravenous or subcutaneous injections of whole or defibrinated blood or of blood serum; also by administering by the mouth large quantities of virulent blood or urine. In the animal which has thus been infected we notice a rise in temperature in from five to nine, up to thirty and even fifty days. The sooner the rise in temperature takes place the higher the temperature will usually run in the course of a few days and the earlier the fatal outcome of the disease. On the other hand, the longer the period of incubation the more likely will the disease run a chronic course. From an animal once infected we can transmit it with the greatest ease to a series of other well animals by the above indicated method.

How the disease is transmitted in nature from one animal to another is still a mystery. It has repeatedly been pointed out, especially by Carré and Vallée, that the virus is easily taken up with contaminated feed and water, but experiments in artificial inoculation by way of the intestinal tract with virulent urine and blood have shown that larger quantities are necessary for the successful production of the disease than are usually taken up by the animal at any one time, so that it hardly seems possible that this could be the natural mode of infection. Horses have been confined for over a year in a comparatively small pasture with sick animals, feeding on the same grass, using the same feed boxes and watering troughs, and exposed to the bites of the same flies and mosquitoes without contracting the disease. These experiments were performed by the Texas Experiment Station. The same
station has also conducted experiments in which a large number of newly hatched Texas fever ticks were allowed to feed on infected animals and immediately afterwards on a well animal, without producing the disease in the latter. Carré and Vallée also conducted similar experiments with the same results. Attention has furthermore been called to the fact that horses and mules harbor a large number of parasites such as *Strongylus armatus* and the larvae of the horse gadfly, but as yet no positive results have been obtained with these parasites as agents of transmission.

Quite recently an entirely new theory as to the cause and transmission of the disease has been developed by the German investigators, K. R. and R. Seyderhelm. According to their results the disease is not an infectious disease at all, but an intoxication produced by the toxins liberated by certain species of the horse gadfly. By repeatedly injecting very small quantities of extracts prepared from these larvae they have been able to produce a disease in horses so similar to pernicious anemia in all its details that it could not be differentiated from it. Moreover, they have been able to produce the same disease in a second horse which had received an injection of blood from a horse which had been made sick in the described manner. Sufficient time has not elapsed since the publication of these results to either confirm or disprove them. At the conclusion of an abstract of their work by the authors, reference is made to the results obtained by a Japanese commission of investigation (Shiga among others) into the cause of this disease. Their work was conducted over a period of five years. Besides confirming what had already been known, they claim to have transmitted the disease to pigs. Furthermore, they state that the urine and feces play no part in spreading the disease. The Texas Experiment Station has tried several times to transmit it to pigs, but has always failed to detect any clinical symptoms in the inoculated pigs. The same is true of attempts to transmit it to cattle and rabbits. In dogs the results were negative twice, while once we had an apparently positive result.

The disease was first mentioned by Lignée and by Charlier in 1843. Dénoe also described it in 1843, and Delafond in 1851. Several other investigators also mentioned it from time to time, but it was not till 1904 that the nature of the disease was cleared up by Carré and Vallée. Up to that time even its infectiousness was in dispute. Carré and Vallée were the first to establish the filterability of the virus and also definitely proved that the disease was infectious. They inoculated animals successfully intravenously and subcutaneously with large and small doses of blood, and also proved that the urine and feces contained the infection. In fact all that we know about the disease at the present time was first worked out in their fundamental investigation. Marek and Ostertag were the first to corroborate their results in 1907. Soon after, a host of other workers started to investigate the disease, but practically nothing new has been added.

While all authors agree that the disease is infectious, with the exception of the Seyderhelm brothers, still the mode of infection is a great mystery, which future investigations must first solve before more progress can be made in successfully combating the disease. Carré and Vallée were the first to state that it was taken up with the feed and water, and recommended that all diseased animals be destroyed and the premises thoroughly disinfected in order to eradicate it. Other investigators also stated that the infection was taken up with the feed and water without proving it definitely. Ostertag states that the occasional
taking up of a mouthful of hay has no serious results. In transmitting
the disease artificially by way of the intestinal tract it is found that it
takes large quantities of blood or urine in order to produce a successful
inoculation, larger quantities than are usually taken up by the horse
at any one time, so that it hardly seems possible that this could be the
natural way of infection. The Japanese commission of investigation
was perhaps the first to point this out, and the Seyderhelm brothers
made the same statement. The Texas Experiment Station has repeatedly
had horses running in a pasture that was none too well drained, all
animals using the same drinking water, without a single case of natural
infection ever taking place. Our knowledge of the nature of other
diseases also does not maintain this view, in so far as they are not
produced by the repeated taking up of small quantities of the infection
which are retained in the body till enough of the virus has accumulated
so that the disease manifests itself by clinical symptoms. This is per-
haps what Hutyra and Marek mean by the statement that the infection
either takes place by the entrance of large quantities of the virus at a
single time or by the repeated entrance of smaller quantities. There
can be no doubt, however, since the infective agent is carried by animals
that have seemingly recovered, that it is also voided with the urine and
feces and thus constantly contaminates the feed and drinking water, so
that it could easily be taken up from these sources.

Besides the filterability nothing is definitely known as to the prob-
able nature of the virus. We know that it is destroyed when the blood
is subjected to a temperature of 58 degrees centigrade for one hour.
Blood serum that is dried will retain its virulence for seven months,
but in the moist state for only three months. The virus is quite resistant
to putrefaction. The remittent character of the fever would indicate
that it is some kind of a protozoan, and in that case insects would likely
play the role of transmitter.

The disease runs an acute or chronic course. Let us say we have
obtained blood from an acute field case and inoculate another horse
with it. Several interesting facts can be noted. The disease will prob-
ably retain its acute character in a series of inoculated animals for a
long time. At the end of five to fourteen days a rise in temperature will
take place which may be only of a medium degree the first day, the
animal shows no other clinical symptoms the next day or two, and then
the characteristic symptoms presently to be described. Again we may
see that the temperature rises quite suddenly and quite high, and the
animal refuses to take any feed. The animal may die within a week
or at the end of that time the temperature will gradually fall to normal,
only to rise again in 24 to 48 hours and seal the fate of the animal
within a week. A third type may be still different. The first three or
four animals may show either one of these types and die within two
weeks, but all of a sudden the course changes entirely, becoming pro-
nouncedly chronic. The fever may remain medium from the start or
the first-fever is very high, but the animal survives and during the
following attacks, usually at long intervals, only a medium fever is
shown. During these intervals the animal shows no signs of a disease
at all, it is apparently cured, but sooner or later a relapse takes place.
We have repeatedly transferred blood from such animals to others in
an attempt to revive the virus, but have always failed. We have also
repeatedly inoculated animals from an apparently acute field case in
an attempt to establish a virulent strain and have frequently trans-
ferred such blood, but for a long time we could not get hold of anything
that would kill the animals. It seems as if the virulence of the virus is attenuated when it is transmitted artificially, which indicates that probably an intermediate host exists. The same was observed by the Canadian investigators. We have also repeatedly reinoculated such animals that showed the chronic type of the disease when they had not had a reaction for a long time to see whether we could not produce an acute attack or immunize them, but we have never succeeded in changing the course of the disease. Carré and Vallée in their first investigation already pointed out the fact that animals suffering with the chronic type could be again inoculated with large quantities of virulent blood, of which very small quantities would kill a sound horse, without showing any effects. On the other hand, the blood from such animals retains its infectiousness for a long time and probably for life, thus endangering all other animals which use the same range or are kept in the same quarters.

As already stated, the first symptoms that will be noted is a rise in temperature and the animal will only reluctantly take up a small amount of feed; usually, however, the appetite remains normal or is even increased. In spite of this increase of appetite, the animal becomes weak and emaciated, often losing one-fourth to one-third of its body weight in the course of a few weeks. The animal can often be seen stepping to and fro, throwing the body weight from one leg to the other. The gait is staggering, the animal swaying to and fro in the hind quarters. If the animal gets down it can rise only with difficulty, or not at all, frequently struggling until it finally dies with exhaustion. The quantity of urine is frequently increased and contains albumen. A serious and slightly blood-stained discharge can sometimes be noted from the nostrils. The mucous membrane of the eyes is pale and yellowish. During an acute attack it shows hemorrhages, especially on the membrana nictitans, which vary greatly in size, sometimes covering almost all the visible mucous membrane, and are red to dark red in color. They are always a bad sign, but should the animal survive they will disappear only to reappear with the next acute attack. Edema appears on the extremities, under the chest and belly, and on the prepuce. Diarrhea may set in and the anus is almost always greatly relaxed. The pulse is weak and rapid. A pronounced venous pulse is noticed.

Changes in the blood are never absent. If blood is drawn in the course of an acute attack one will notice that there is a constant decrease in the number of red blood corpuscles. The technique of ascertaining this decrease varies with the different investigators. When the gravity test is used it is best to use a graduated receptacle. We take a 50 c.c. burette that is cut off a little below the 50 c.c. mark and insert a rubber stopper so that the end of it exactly coincides with the 50 c.c. mark. In order to keep the blood from coagulating enough potassium oxalate is added so that the 50 c.c. of blood to be drawn contains exactly 0.2 per cent and is then shaken up with the blood. When the blood settles in the course of a day one can read off the amount of red corpuscles in percentages. At the end of a week of fever, we have often noticed with this method that the percentage of red blood corpuscles had gone down to 26 to 30 per cent, while normally it is about 45 per cent. This shows a reduction of over one-third in the number of red blood corpuscles. The serum which collects over the corpuscles shows a deeper yellowish color than normal.

On examining the blood microscopically one finds all the changes
found in other anemias. The red blood corpuscles are very fragile, parts of them being broken off, and they have changed their characteristic disc-shape. Frequently one will see two small pear-shaped bodies which are connected by a delicate filament of protoplasm and forming different angles with one another and taking the stain of the red blood corpuscles. Nucleated red blood corpuscles are also found and often they contain small blue bodies of different forms. These were first described by Carré and Vallée. They state that when they are colored with the basic anilin dyes they disclose the shape, size, and color of a piroplasma, and that one is tempted to consider them globular parasites. They have been repeatedly noticed in anemias in man. Mack of Nevada has also called attention to them. Furthermore, many micro- and macrocytes are noticed. Many of the red blood corpuscles contain basophilic granules.

On post-mortem examination we find the cadaver greatly emaciated. Edematous infiltrations will be noticed in the subcutaneous connective tissue. The blood has a decidedly watery appearance, the serum and red blood corpuscles separating rapidly, and coagulation is slow. The muscles will often be seen to present a pale appearance. Upon opening the abdominal cavity, thoracic cavity, and pericardial sac a large quantity of a clear yellowish serous fluid will be found in them. Especially in the pericardial sac the quantity is greatly increased, there often being as much as a liter. In the very acute cases the intestines, large and small, will be covered with petechiae, irregular in outline and ranging in size from small spots to the size of a dollar and even larger. The heart also shows these hemorrhages, especially in the ventricles. Less frequently they will be found on the other internal organs. They may even be entirely absent, especially if the disease has a tendency to run a chronic course.

In the very acute type the spleen may be greatly enlarged and covered with petechiae. On section the pulp will be very soft, mushy, and dark red, almost black in color. Nodular prominences may be seen on the surface of the organ, in places where the pulp is especially soft. If the animal succumbed to a chronic type of the disease, this organ shows no tendency to become soft, on the contrary, it may even appear drier.

The liver frequently appears very fragile, so that it is easily torn, and may be slightly enlarged.

The kidneys appear pale and friable in the chronic type. The capsule is easily removable. In the acute form they will show petechiae.

The bone marrow presents the profoundest changes in all cases. The lesions are particularly evident in the femur, but they can also be found in most of the other bones. The marrow appears very hemorrhagic, brick-red to black in color, and soft. These changes are especially to be seen in the proximal end of the femur.

It will be noticed from the above that the post-mortem changes are by no means uniform in all cases. Especially in the chronic cases they may be entirely absent. This brings up the question of diagnosis which is by no means easy, only the inoculation of another animal giving us positive proof of the presence of the disease. Although some authors state that the diagnosis is easy, the Bureau of Animal Industry in its 28th Annual Report states that it is necessary to discover an accurate and early method of diagnosis, inasmuch as without this it is impossible to determine the value of any given line of treatment, and the progress of immunization, or to establish the identity of the disease.
in localities where it has not been previously recognized. It is the chronic form that gives one so much trouble, the rises in temperature often being so slight and lasting for such a short period that one is often in doubt.

Many drugs have been recommended for the treatment of this disease, such as sulphate of quinine, arsenic and its different compounds, general tonics, etc., but they all seem to be a failure. Boulin claims to have effected some cures by treating the animal with soluble mercury and arsenic salts, but here too there may have only been a temporary improvement in the animal's condition. The Texas Experiment Station has carried on a number of experiments in treatment with atoxyl, trypanrot, and trypanblau, but the results failed to show anything positive. Even if an improvement in the patient should take place following the use of drugs, one is hardly justified in saying that the disease has been cured, since we know that improvement and even an apparent cure may take place without the use of drugs, that the patient will eventually show a relapse and when his blood is transferred to another animal it will be found to be still infectious.

WORTHLESS DISINFECTION—A SERIOUS PROBLEM IN LIVE-STOCK 'SANITATION.

J. T. Ainslie Walker, New York, N. Y.

Introduction.

The struggle against disease is very largely a struggle against infection, and seeing that pathologists are now agreed that the causal agent in each case of infectious disease is a micro-organism, or germ, it follows that the destruction of this causal agent must always be an important factor in the struggle.

Fresh air, direct sunlight, boiling and dry heat all play a part in the destruction of germs; but circumstances in which one or other of the above can be brought into play are necessarily limited, and for this reason chemical disinfectants are the agents most commonly relied upon. It is unfortunate, however, that while the last quarter of a century has witnessed so many progressive strides in bacteriological science, and as a natural result, in that of disinfection, certain methods which have long since proved to be of very restricted germicidal value still have a considerable—though a rapidly diminishing—number of adherents. One does not unwittingly accept responsibility for the suggestion that apathy, or inability, or disinclination to keep abreast of the times is responsible for this unsatisfactory state of affairs, but at the same time it is difficult on any other grounds to explain why the primitive methods of the pioneer workers should still find a place in any modern system of dealing with infectious disease; it is equally difficult to explain why, in every state of the Union, with the single exception of Maryland, the law permits the sale of "disinfectants" which do not disinfect.

The recent outbreak of foot-and-mouth disease has served once more to call attention to the much needed revision of official regulations dealing with the disinfection of cattle cars used in the interstate movements of live stock.

Disinfectants Officially Approved.

In November last the disinfectants authorized by the Department of
Agriculture, Washington, D. C., for use in railroad cars, cattle-pens, and stables where animals suffering from foot-and-mouth disease had been confined were as follows:

A 5 per cent solution of carbolic acid.
Chloride of lime, U. S. P. 1 lb. to 1½ gallons of water.
Formaldehyde, 1 quart, 40 per cent solution, to 5 gallons of water.
A 3 per cent solution of cresol compound, U. S. P.

**Carbolic Acid.**

As regards carbolic acid, a common specification reads: "It must contain not less than 95 per cent of carbolic acid and be free from tar oils and sulphuretted hydrogen." The acid referred to in this specification was originally present in the form of phenol (i.e., pure carbolic acid), a saturated aqueous solution of which may contain, say, 5 per cent. Latterly, however, more profitable uses have been found for phenol, of which there is little, if any, in the commercial "carbolic acid" of today. The specification quoted demands practically that the phenol be replaced by cresylic acid, an ordinary sample of which, containing upwards of 97 per cent tar acids, and in all respects up to the most exacting of specifications, requires about 200 times its volume of water to dissolve it, even with difficulty. The futility of attempting to prepare a 5 per cent solution of this product should be apparent, but a teaspoonful dropped into a tumbler of water would convince the most skeptical. Wolf Defries in his "Standard Disinfectants" says: "The disinfectant value of commercial 'carbolic acid' can not be estimated by methods of chemical assay, and the widespread impression which appears in many forms of contract adopted by users that the presence of a given percentage of carbolic or other tar acid establishes in itself a given bactericidal efficiency, is wholly unfounded." These facts should be sufficient to demonstrate the fallacy of employing "carbolic acid" as a disinfectant for general use.

**Chloride of Lime.**

Chloride of lime belongs to that group of disinfectants which act by oxidation. Notwithstanding the fact that one of their chief characteristics renders them totally unsuitable for practical work, the hypochlorites, of which chloride of lime is the commonest form, are largely used as disinfectants. When brought into direct contact with certain organisms chloride of lime undoubtedly exercises marked germicidal effect. This, however, is immediately neutralized when organic matter is present, which in actual practice is invariably the case. Dr. Doty says: "When it is deemed advisable to use lime as a disinfectant, it should be used largely in excess of the material treated, particularly if chloride of lime is selected, for in the presence of organic matter this preparation is decomposed and practically rendered inert;" while Gruber has shown that for the efficient disinfection of cattle wagons treatment with a solution of chlorinated lime ought to be preceded by a thorough cleansing with water under pressure, and preferably at a high temperature, and that chlorinated lime solution ought then to be applied six or seven times. Applying the solution once, or even twice, gave no satisfactory result.

**Formaldehyde Solution.**

Of formaldehyde in 40 per cent solution, it need only be said that its bactericidal efficiency or germ-killing power is one-third that of
carbolic acid; that the working dilution, equivalent to 5 per cent car-

bolic acid, is therefore about one in seven—a dilution which, apart from

the question of cost, is found to be impracticable on account of the

intensely irritating nature of the gas given off; added to which it is

incompatible with serum, mucus, and albuminous matter generally, a

disability which renders it unreliable in the treatment of secretions of

the mouth and nose.

Cresol Compound.

The cresol compound, U. S. P. (Liquor Cresolis Compositus of the

United States Pharmacopoeia) is found to vary considerably in bacteri-

cidal power.

Cresol ...................................... 500 grams
Linseed oil .................................. 350 “
Potassium hydroxide .......................... 80 “
Water, a sufficient quantity to make...... 1,000 “

There are here four variables—the oil, the cresol, the potash and

the operation; no tests are prescribed. It is not surprising, therefore,

that samples have been found to show germicidal values varying

between 1.5 and 4.5. It will be admitted that where there is no uni-

formity of efficiency, there can be no uniformity of result; in other

words, where a 3 per cent solution is efficient when the preparation

shows a 4.5 coefficient, the same dilution will be inefficient when the

preparation shows a coefficient of 1.5.

The foregoing particulars of the unsatisfactory characteristics

of the disinfectants touched upon should be sufficient to show the unde-

sirability of their use in any scheme of live-stock sanitation. In the

absence of efficient substitutes there might be some reason for utilizing

to the fullest extent the limited capabilities of these obsolete processes;

but this argument is no longer tenable, by reason of the fact that the

very manufacturers who supply carbolic acid and cresol compound to

the railway companies, stock owners, and others interested in the

present problem, are prepared to supply disinfectants 10, 15, and even

20 times more efficient than pure carbolic acid, and that the railway

companies, stock owners, etc., are desirous of taking advantage of the

greater safeguard offered by the adoption of these high testing dis-

infectants, in connection with the quarantine regulations. Nothing, how-

ever, can be done in this direction without the consent of the Bureau of

Animal Industry, whose attitude in this matter it is difficult to

understand.

Rideal-Walker Test.

But how, it might be asked, is the efficiency of a disinfectant to be

guaranteed? Until comparatively recent years, this question would have

been difficult to answer, but with the aid of modern scientific methods

it now presents no difficulty. In the method introduced by Dr. Samuel

Rideal and the writer, the figure defining the germicidal value (known

as the Rideal-Walker coefficient) is arrived at by dividing the strength

of the disinfectant under test, which will kill a certain organism in a

given time, by the strength of pure carbolic acid required to kill the

same organism in the same time and under exactly similar conditions.

For example, if a 1 in 2,000 solution of disinfectant X will kill a certain

strain of typhoid bacillus in five minutes and a 1 in 100 solution of

carbolic acid will kill the same organism in the same time (and at the

same time), the carbolic acid coefficient of X is $2000 \div 100 = 20.0$.

Similarly, when dealing with a disinfectant of lower bactericidal power
than carbolic acid, if a 1 in 70 solution is required to perform the same task as a 1 in 100 solution of carbolic acid, the coefficient is $70/100 = 0.7$.

By the use of this test it is possible to determine the germicidal efficiency of any preparation (with or without organic matter), thus converting disinfection from a speculative and frequently useless process to a reliable and scientific method of preventing the spread of infection.

**Dilution Control.**

Having obtained the Rideal-Walker coefficient of our disinfectant, the following simple rule affords a ready means of calculating the proper dilution at which it should be used. A fair average working dilution of pure carbolic acid as employed at hospitals, etc., for general disinfection, may be taken as 1 part in 25 parts of water, and the corresponding dilution of any other product may be obtained by multiplying this factor by the coefficient of the article in question. Thus, the proper dilution of a disinfectant having a coefficient of 5 would be $25 \times 5$, i.e., 1 in 125. When the coefficient is, say, 20, the corresponding dilution would be $25 \times 20$, or 1 in 500. The following table gives the coefficients for a number of commonly used disinfectants when tested against the standard typhoid organism:

### A Few R.-W. Coefficients.

<table>
<thead>
<tr>
<th>Disinfectant</th>
<th>Organism</th>
<th>Coefficient_Rideal-Walker</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B. typhosus</td>
<td>20.0</td>
</tr>
<tr>
<td>B</td>
<td>&quot;</td>
<td>20.0</td>
</tr>
<tr>
<td>C</td>
<td>&quot;</td>
<td>2.5</td>
</tr>
<tr>
<td>D</td>
<td>&quot;</td>
<td>2.5</td>
</tr>
<tr>
<td>E</td>
<td>&quot;</td>
<td>2.5</td>
</tr>
<tr>
<td>F</td>
<td>&quot;</td>
<td>1.0</td>
</tr>
<tr>
<td>G</td>
<td>&quot;</td>
<td>1.0</td>
</tr>
<tr>
<td>H</td>
<td>&quot;</td>
<td>0.3</td>
</tr>
<tr>
<td>I</td>
<td>&quot;</td>
<td>0.3</td>
</tr>
<tr>
<td>J</td>
<td>&quot;</td>
<td>0.04</td>
</tr>
<tr>
<td>K</td>
<td>&quot;</td>
<td>0.02</td>
</tr>
<tr>
<td>L</td>
<td>&quot;</td>
<td>0.02</td>
</tr>
<tr>
<td>M</td>
<td>&quot;</td>
<td>Nil</td>
</tr>
</tbody>
</table>

By the compulsory use of this test consumers would be absolutely protected against misrepresentation and fraud, and much useless and, indeed, mischievous so-called disinfection would be avoided. The method is used by all Government departments and health authorities in Great Britain. In this country it has been adopted by the Insecticide Board of the Department of Agriculture—the body responsible for the administration of the act regulating the manufacture and sale of disinfectants—and by at least one state and a number of city health authorities and large corporations. From recent indications there is every reason to believe that the movement in favor of standardization is at last receiving the attention which its importance merits.

Having shown the reasons which render disinfection necessary and how an efficient disinfectant may be selected, there remain only for consideration the method of application and the cost.

**Method of Application.**

The application of a disinfectant in the form of a liquid spray is for many reasons to be preferred to any attempt at gaseous disinfection,
notably because a disinfectant when applied to infected matter in a liquid form is more likely to come into actual contact with the organism, and because the process tends to prevent dust, the common vehicle of infection, from rising into the air.

Aerial disinfection, or sulphurous fumigation, is still carried out in many places in this country, in spite of the fact that it has been repeatedly condemned by international congresses and scientific workers generally. The inefficiency of this method of disinfection was first pointed out by Koch more than 30 years ago when he said that sulphur dioxide, with or without water, was entirely useless for the disinfection of spores, and quite unreliable for the disinfection of sporeless organisms in the presence of any superficial protection. This pronouncement has since been confirmed by numerous other investigators, among them Surgeon General Sternberg, who characterized sulphurous fumigation as a farce, and the British Medical Journal, which declared it to be "unreliable in laboratory use and simply ridiculous in practice."

**Fumigation Obsolete.**

Apart from the small germicidal effect of this process upon the majority of micro-organisms, the conditions necessary to insure any effect at all are so exacting as to render the process quite unsuitable for ordinary purposes. It is essential, for instance, that the apartment under treatment be hermetically sealed and remain in that condition for at least 24 hours after the completion of fumigation. The atmosphere, too, must possess a certain degree of moisture; but as to what degree, even experts differ, as pointed out by Dr. Alvah H. Doty in his "Prevention of Infectious Diseases." A circumstance so common and seemingly trivial as the presence of a lime-washed ceiling, which will absorb a considerable quantity of gas, may be sufficient to nullify the whole process, while the fumes are not only injurious to the contents of the room, but have been known to prove fatal to those who inhaled them.

Contrary to the generally accepted notion as to the use of formaldehyde for fumigating rooms, this disinfectant does not act in the form of a vapor or gas; in practice it is dissolved in the minute droplets which result from the condensation of steam, in the absence of which formaldehyde has no bactericidal action whatever. Water will take up in solution 40 per cent of formaldehyde gas, in which form it is known officially in the United States Pharmacopoeia as "formaldehyde solution," the coefficient of which as we have seen is one-third that of carbolic acid. If we take one part of carbolic acid in twenty-five parts of water as our standard of efficiency, to prepare a dilution of "formaldehyde solution" capable of doing the same work, one part must be mixed with seven parts of water.

We now see the difficulty of obtaining uniformly trustworthy results when working with formaldehyde. If too much steam is admitted into the chamber the ultimate dilution produced may be too weak, and if too little steam is admitted, part of the formaldehyde will be unavailable, i.e., it will remain in the gaseous form, which, as already explained, has no bactericidal action.

The British Medical Journal for November 3, 1894, referring to the disinfection of rooms by fumigation, stated: "On the ground even of economy there is no comparison between this obsolete process and the disinfectant spray; and while cases of renewed house infection are familiar to almost every medical officer in this country, we have Dr. Dujardin-Beaumetz's authority for saying that where the dis-
infectant spray has been introduced they are practically unknown in France."

Liquid Spray Simple, Reliable and Inexpensive.

For these reasons fumigation is rapidly being superseded by the liquid spray. Not only is the latter process so simple that any able-bodied person can execute it, but from the fact that the disinfectant is brought to bear upon the germ direct (whereas, in fumigation, the medium of contact is the atmosphere) it must follow that efficient disinfection is far more likely to be accomplished. The application of a liquid disinfectant is very simple. In the case of the floors—the most important consideration—it may be applied by means of a fine rose-head sprinkler or garden syringe. For the walls and ceilings a spraying machine should be used—one which diffuses so fine a spray that with ordinary care no part of the surface escapes treatment.

It would be somewhat in the nature of a counsel of despair if these necessary measures of disinfection could be efficiently carried out only at a high cost. Happily this is not so. A glance at the table given below will show how readily various disinfectants can be compared in this respect by the application of the test described above.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Organism</th>
<th>Rideal-Walker Coefficient</th>
<th>Price Equivalent to One Gallon Carbolic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B. typhosus</td>
<td>20.0</td>
<td>$1.50</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>5.0</td>
<td>$1.00</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>1.0</td>
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</tr>
<tr>
<td>D</td>
<td></td>
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</tr>
<tr>
<td>E</td>
<td></td>
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<td>$3.50</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>0.3</td>
<td>$1.50</td>
</tr>
</tbody>
</table>

Cost Per Unit of Work.

Thus A, with a co-efficient of 20, i. e., having twenty times the strength of pure carbolic acid, will do the work of one gallon of the latter at a cost of 7 cents; to perform the same work with F would cost $5.00. Similar comparisons can be made with any other disinfectants, the cost per unit of work, i. e., the work capable of being performed by one gallon of pure carbolic acid, being obtained by dividing the price per gallon by the coefficient.

Using a spraying machine and working with a 1 in 600 solution of A, a superficial area of 10,000 square feet could be disinfected daily at a cost of (approximately) 25 cents per week.

The cost, therefore, is not prohibitive, and to stock owners and others interested in the problem of live stock sanitation, the gain is out of all proportion to the actual cost, for it must be clear that efficient disinfection may be employed not only during outbreaks of disease, but also in the prophylaxis of disease (as part of the cleansing routine) with a certainty that it provides against the spread of infection an important safeguard which no one concerned is justified in omitting to apply.

It is interesting to note that the only Federal authority calling for supplies of disinfectants—the General Supply Committee of the Treasury Department at Washington—has adopted the high coefficient disinfectant. It is to be hoped that the Bureau of Animal Industry will follow its example at an early date.

230
In conclusion, the writer desires to commend the following control clause to the careful consideration of all members of the Live Stock Sanitary Association. It appears in the proposal forms of many of the largest corporations in this country, including the Western Electric Company, the United Fruit Company, the Borden's Condensed Milk Company, the Pennsylvania and Erie railroad companies, etc.:

"Any disinfectant fluid may be submitted, provided that it has a guaranteed Ideal-Walker coefficient of at least 20 when working with vigorous cultures of B. typhosus, and that it is miscible with water in all proportions, does not separate out on standing, and flows freely from the container at all times.

"N. B.—Samples of deliveries will be examined bacteriologically and where found not up to specification the manufacturer or his agent will be required to bear the cost of the test, and to replace such defective delivery at his own expense."
BUSINESS SESSIONS.

Proposal for Change in By-Laws for Consideration at Next Annual Meeting 1915.

In accordance with Section 11 of the By-Laws, Dr. C. M. Haring, Chairman of the Executive Committee proposed the following change to be acted upon by the next meeting:

That Section 5 of the By-Laws regulating membership in this Association be amended to provide for two classes of membership, Active and Associate. When so amended, Section 5 of the By-Laws shall read as follows:

SECTION 5. The membership of this Association shall consist of Active members and Associate members.

Any person actively engaged in live-stock sanitary work for Federal, State, Territorial, County, or Municipal Governments shall be eligible to active membership.

Upon severing his official connection with Federal, State, Territorial, County or Municipal Government such member shall automatically be transferred to an Associate membership.

Any person interested in live-stock sanitation may be elected to Associate membership. All applications for Associate membership must be recommended by the Executive Committee and receive a two-thirds vote of the membership present.

Only active members shall be eligible to the Presidency and Vice-Presidency of this Association.

A majority of all standing committees, including the chairman of such committee shall be active members.

Election of Officers.

The following were duly elected officers in the Association: President, Dr. J. I. Gibson. Vice-presidents, Dr. B. F. Davis, Dr. J. G. Wills, Dr. O. E. Dyson, Dr. E. P. Flower, Mr. W. P. Anderson. Secretary-Treasurer, Mr. J. J. Ferguson.

In Memory of Doctor Daniel Elmer Salmon.

WHEREAS, the United States Live Stock Sanitary Association has been advised of the death of Doctor Daniel Elmer Salmon, on August 30, 1914.

RESOLVED, that this Association recognize in Doctor Salmon one of the great leaders in live-stock sanitary science. His investigations of Texas fever, hog cholera, and the principles of immunity brought him world-wide fame; his leadership in the successful campaign to eradicate pleuro-pneumonia among cattle in the United States brought him special recognition by the National Congress; and his organization and direction of the United States Bureau of Animal Industry for a period of more than twenty years stamps him as an executive of great ability. As an executive officer he was ever kindly and considerate, and as a friend he was ever steadfast and true.
RESOLVED, that these resolutions be spread upon the records of this Association as permanent evidence of our esteem for Doctor Salmon as a man, and of our admiration of his splendid accomplishments.

In Memory of Col. Albert Dean.

WHEREAS, our esteemed friend and collaborator, Colonel Albert Dean has been called from labor to rest, and
WHEREAS, he was one of the organizers of this Association and remained an active member until death, and
WHEREAS, his genial personality was brilliantly reflected in the countless throng who proudly proclaimed him their friend; a pioneer in our efforts along the line of live-stock sanitary control, his able counsel and his indomitable enthusiasm and perseverance helped to illuminate our path of progress.
Recognizing the value of his services, this Association mourns his loss and extends to his family its condolence and sympathy, and
BE IT RESOLVED, that this Association acknowledges a grievous loss in his departure, and
BE IT FURTHER RESOLVED, that a copy of this resolution be inscribed in the Proceedings of this Association and that a copy be forwarded to his family.

REPORT OF THE SECRETARY-TREASURER.

The following report was duly adopted by the Association:
April 28, 1914, the Secretary wired all members of the Executive Committee of this Association suggesting a special meeting of the Committee to consider the drafting of recommendations addressed to the Governor of each state recommending immediate action by state authorities for state control of anti-hog-cholera serum laboratories operating within the various states without a Federal license.
May 6th, the Committee met at Chicago, all members represented either in person or by proxy. The following recommendations were drafted and the Secretary instructed to forward a copy to the Governor of each state, which was done. Favorable acknowledgments were received from 37 governors and prompt action taken by several states
WHEREAS, hog cholera gives promise of being extremely prevalent during the coming season, and
WHEREAS, reliable hog cholera serum as produced under the Dorset-McBride-Niles system is of great value in controlling and suppressing the disease;
WHEREAS, it has come to the knowledge of this Committee that many hog cholera serum plants are in operation in various states which plants are not licensed by the U.S. Department of Agriculture nor under Federal or state supervision;
WHEREAS, we believe there is much serum being placed upon the market, which may be absolutely unreliable and a detriment to hogs upon which it is used;
WHEREAS, attention has been further directed to the placing on the market of fictitious serum, which in some cases is known not to have contained any animal serum;
THEREFORE BE IT RESOLVED THAT, all state authorities be advised to adopt regulations whereby all hog cholera serum plants may be inspected and their products supervised as herewith recom

233
mended and when so supervised their products recommended as consistently as may be deemed advisable by state officials.

They shall maintain entirely separate equipment for the handling of serum and virus; and

All equipment, containers, machinery, instruments and other apparatus used in the preparation of viruses and serums, shall be thoroughly sterilized before use by live steam at a temperature of at least 120 degrees Centigrade for not less than half an hour or exposed to dry heat of at least 160 degrees Centigrade for at least one hour. If for any reason such sterilization cannot be applied, then a process known to be equally efficacious in destroying microorganisms may be substituted.

They shall keep separate temperature and number records of all hogs entering into the manufacture of serum and virus and the testing of serum.

All premises used for the production and testing of serum or virus shall be properly ventilated, lighted and maintained in a sanitary condition, so located as to avoid the spread of the disease and with suitable arrangements for the disposal of refuse.

All products shall be stored in a cold chamber or refrigerator for preservation until such time as they are removed from the premises.

Virus used for simultaneous treatment must be collected only from hogs which are inoculated by the establishment.

The temperature of supposedly virus hogs should not be accepted as proof of hog cholera unless supported by post-mortem examination. The indiscriminate distribution and sale of virus should be prohibited and its use limited to graduate veterinarians, who have had special training in the proper and careful use of virulent blood, and duly authorized to use the same.

Each container should show the firm name of the manufacturer and true name of product and date of manufacture.

The simultaneous method should be used only in infected localities, except in cases of recorded breeding herds and then only under direction of state officials.

The importation of hogs be prohibited unless accompanied by a certificate of health issued by a duly accredited veterinarian certifying that such hog is from an uninfected territory or in case of vaccinated hogs, that the same have received the serum-virus treatment at least 30 days prior to entry and the animal dipped immediately prior to shipment in a compound solution of cresol, according to Government requirements.

The state authorities make arrangements with their respective state veterinary associations with a view to their adopting a schedule of fees covering the work of vaccination.

The operation of serum plants be under the direct supervision of a competent veterinarian or other professional man whose training and experience have fitted him for this work.

S. H. WARD, President.
JOHN J. FERGUSON, Sec'y-Treas.
C. M. HARING
F. S. BROOKS
V. A. MOORE
C. H. STANGE
E. R. FORBES.

EXECUTIVE COMMITTEE.
The Executive Committee, May 6, by resolution asked President Ward to prepare a special bulletin on the control of hog cholera. It was duly prepared by Dr. Ward and distributed to live stock and farm papers and all members August 10, 1914.

The Bulletin is herewith given as follows:

Suggestions for the Control and Prevention of Hog Cholera.

The extreme prevalence of hog cholera last year and the great losses sustained are still vividly impressed upon the minds of farmers and breeders, and considerable thought is undoubtedly being given as to the best way and means of preventing a like occurrence this year.

It must be borne in mind that the disease is of germ origin, and is acquired by hogs through contamination of their food supply. This contamination may take place in a variety of ways, principally, however, by birds, dogs and man carrying the disease germs on small particles of dirt or manure gathered up from places where the disease has been or is present.

The majority of hog pens are in filthy condition, as a result of the accumulation of litter and manure gathered through months and perhaps years. Many times food is scattered in the pens and becomes contaminated by all kinds of filth before being eaten by the hog, hence if cholera has existed the litter and manure has been saturated with the body discharges of sick animals, and is alive with germs.

To control the disease, owners of hogs must be educated to the importance of sanitary measures, and not be permitted to lapse into indifference because of the possible use of sorum as a cure or preventive.

A steady war should be waged on pigeons and crows, which feed in infected pens and carry the disease all over the vicinity.

Dogs are frequent carriers of the disease, and should not be allowed to run at large, even on owner's premises, if cholera exists in the neighborhood.

Stock buyers, strangers, and neighbors visiting the premises should keep away from hog pens, and the individual owner should not let his curiosity lead him to tramp near or in hog pens belonging to his neighbor.

All outbreaks must be quarantined and only the owner or his help allowed to go near the diseased animals. To curtail the losses, the single treatment should be given and the operator and helpers must take the precaution of using rubbers while working, removing and disinfecting them after completion of the vaccination.

Explicit directions should be given by the veterinarian that pens are to be cleaned daily and disinfected with a solution of cresol, U. S. P., six ounces to a gallon of soft water.

Above all, dead hogs are to be buried or burned. Allowing dead hogs to remain unburied, the placing of dead hogs in low places, or dried up water courses, should be made a misdemeanor. If no statute covers these matters, then sanitary authorities should adopt regulations which will effectively deal with them.

Wagons used in removing dead hogs, or in drawing away litter and manure from the pens should under no circumstances be taken on to the public highway.

Thorough and complete disinfection of the pens and yards should be practiced daily, using the disinfectant of the strength already described. Where outbreaks occur, stock buyers should be warned against visiting the premises and should be advised of the great danger there
is in carrying the infection from farm to farm, and to avoid it by using rubbers, to be removed and disinfected after visiting individual farms, no matter whether cholera exists on the premises or not.

Railroad stock yards are a prolific source of spread, and a regulation should be issued forbidding the removal of hogs from stock yards except for shipment by rail for immediate slaughter. Railroad yards and pens should be cleaned of all litter and manure and then disinfected after each shipment.

Persons delivering stock to these yards should be warned, by posted notices, to avoid going into "yards."

**Prevention.**

As the disease is without doubt taken up with the food supply, the question arises: How best protect it from infection?

It is suggested small feeding pens be built with closely woven wire fence to which hogs should be admitted only at feeding time. These pens should have a cement floor, which must be kept clean of all litter and manure and then sprinkled with the solution previously mentioned. Troughs should be disinfected and lifted off the floor and exposed to the sun.

Sleeping quarters should be arranged so they can be kept clean and disinfected. Good pastures away from water courses and roads are necessary, in order to prevent any infection being carried by stray animals, or from contaminated water.

As a further precaution, not only against hog cholera but against various parasites which swine are often troubled with, a dipping vat can be built with very little expense and a cheap disinfectant used.

The disease is not borne in the air but is acquired by taking into the system the disease germs.

Protect your hogs from coming in contact with sick hogs and protect their food and water supply from contamination.

When the disease has existed, it is wise to provide new quarters entirely for the brood sows. While young pigs from immune mothers carry an immunity for a short time they are liable to infection later if permitted to remain in infected quarters. It is well to plow and seed the old yards.

**Foot-and-Mouth Disease in the United States.**

As soon as the outbreak which developed last autumn became serious, your Secretary planned to issue each week bulletins summarizing the control situation in the various live stock states. It soon developed that through pressure of work or indifference most of the officials in charge would not furnish information with sufficient promptness to permit issuing bulletins with any regularity. Up to the present Special Bulletins on the epidemic have been issued as follows:

October 30, 1914; November 13, 1914; January 13, 1915.

These bulletins were taken as official by live stock and country papers and we believe had a good influence in combating sensational reports over the country.

**Co-Operation With Chicago Medical Society.**

Supplementing favorable action by this Association, December 4, 1913, your Secretary has worked with the executive of the Chicago Medical Society and arranged for a joint program for one session of this meeting. I trust this action will be followed up by our members in their several locations and lead to a better understanding between state
and municipal health officials who are in so many cases interested in many of the problems with which members of this Association deal in their official capacity.

Official Delegates to the International Veterinary Congress, London, August 3-8, 1914.

In pursuance of Resolution duly made by this Association at our last meeting, credentials were issued to Dr. S. H. Ward and in blank to two others to be nominated by Dr. Ward on his arrival at London.


In pursuance of Resolution of this Association, credentials were issued to Dr. R. F. Davis, Wyoming, Mr. W. N. Waddell, Texas, and J. J. Ferguson, Chicago. A splendid relation was established between this Association and your Association as indicated in a separate report. The co-operation of the American National Live Stock Association can easily be made a strong factor in directing desirable legislation in the various states and at Washington.

Seventeenth Annual Report.

Work of editing this Report involving much detail was handled in an exceptional manner by Dr. B. H. Ransom, Washington, D. C.; 1,000 copies were printed and 800 distributed. The report received favorable notice from a large number of farm and live stock papers, many articles being reproduced by them.

Special Bulletins Since Our Last Meeting.

Three thousand five hundred bulletins have been published and practically all distributed.

Suggestions for Increasing Usefulness of the Secretary’s Office.

1. Reporting by members of unusual matters of interest occurring within their states. If of sufficient general interest these reports will be issued by this office in bulletin form to members and the press.

2. A more general and prompt response on the part of members to requests for certain specific information.

3. Better co-operation on the part of old members in securing applications for membership.

General Information.

During the year we received and answered an unusually large number of letters from state and municipal officials regarding proposed legislation or legislation already in effect in other states. We have reason to believe this feature of the Association work has become very helpful and valuable.

Membership.

On February 10, this Association had 228 members, 19 applicants, total 247, an increase over 1913 of 74 members.

I beg to submit herewith my report as Treasurer from November 30, 1913, to February 10, 1915.

237
Receipts.

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<tr>
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<td>Bills receivable from program advertising</td>
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<td>Expenses</td>
<td></td>
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<tr>
<td>Office expense, printing circulars, stationery, postage, exchange,</td>
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</tr>
<tr>
<td>per vouchers attached</td>
<td>$ 972.14</td>
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<td>$1,214.85</td>
</tr>
</tbody>
</table>

**REPORT OF THE COMMITTEE ON FINANCE.**

The following report was duly adopted by the Association:

Your Committee has checked the accounts of the Secretary-Treasurer and find same to be correct. (For summary see report of Secretary-Treasurer.)

W. F. CREWE,
D. F. LACKEY.

**REPORT OF THE COMMITTEE ON LEGISLATION.**

The following report was duly adopted by the Association:

Your Committee has collected the following data which include a brief summary of live stock sanitary legislation of the various states effective during the year 1914. They do not include information concerning foot-and-mouth or hog cholera legislation. As the state legislatures commonly meet biennially, the amount of new legislation in 1914 is probably less than that which appeared in 1913.

The most uniform action taken by the states in 1914 was the recognition of the ophthalmic mallein test for the diagnosis of glanders among horse stock by all states with the exception of Louisiana, Maryland, New Hampshire, West Virginia, and South Dakota.

By proclamation of the Governor, the State of Illinois gave official recognition of the tuberculin test as a requirement for the entrance of dairy and breeding cattle into the state, while this test has been similarly recognized by the regulations adopted by the State Board of Health of Florida, effective September 1, 1914. This action leaves but two states—West Virginia and Rhode Island—which have not given official recognition to the tuberculin test.
In North Dakota, provision was made for the appraisal and destruction of horse stock affected with dourine.

In Oregon, sanitary supervision was given the Live Stock Sanitary Board over diseases of poultry as well as other live stock, which inclusion of poultry is not usual.

Among the legislative lessons taught by the present foot-and-mouth disease outbreak, is the urgent need of the Federal Government, and many of our states, for more available emergency funds. The time of meeting of the various state legislatures varies from annually in six of the states to quadrennially in Alabama, the majority of the states holding their legislative sessions biennially. In Kentucky and Maryland the next legislative sessions do not begin until January, 1916.

In the interim between these sessions, many unforeseen disasters may arise, calling for urgent need of funds for the public benefit. This applies not only to the live stock industry, but to all other lines of public emergency. In the absence of funds those upon whom public work devolves may be so hampered that their best efforts may frequently be nullified or rendered inefficient.

It is impossible to state with any accuracy the amounts which these emergency funds should contain. Other financial conditions must naturally govern this to a large extent. Certainly not less than $50,000 should be set aside by the average state. Your Committee learns with pleasure that Colorado is considering this proposition with the view of getting an emergency fund of $100,000. These funds could be made payable on the orders of the Governor of the state, who could dispense them when absolute necessity arose, upon request of proper heads of departments. The manner of dispensation is of minor detail, but the necessity of such funds is most urgent.

J. R. MOHLER, Chairman.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

The following report was duly adopted by the Association:

Advisory Committee.

WHEREAS, owing to the prevalence of foot-and-mouth disease and the possibility of recommendations and information being needed by state sanitarians, it is hereby recommended that an Advisory Committee of three be appointed to consult with the Secretary, and it is further recommended that the Chairman of such Committee be a member of the Executive Committee.

Committee on Diseases.

WHEREAS, there is considerable diversity in vogue in the various states governing regulations for the control of contagious and infectious diseases of live stock, and
WHEREAS, it is believed more uniform measures should be adopted; be it
RESOLVED, that the President of this Association be instructed to appoint a committee of three for the purpose of drafting and submitting at each annual session some recommendation whereby general and uniform control of one of the contagious and infectious live stock diseases may be submitted and recommended to all live stock sanitarians of the United States.

O. E. DYSON, Chairman.
REPORT OF THE COMMITTEE ON EXTENSION WORK OF INTERNATIONAL TUBERCULOSIS COMMISSION.

The following resolution was duly adopted by the Association:

RESOLVED, that it be expressed as the sense of this Association that we shall favor the general plan of Federal and Dominion registration of tuberculosis-free herds of pure-bred cattle as recommended by the International Commission on Control of Bovine Tuberculosis, and urge our Federal Department of Agriculture to get this under way as speedily as advisable.

BE IT FURTHER RESOLVED, that we favor state registration and properly guarded interstate reciprocity for tuberculosis-free herds of pure-bred cattle.

M. H. REYNOLDS, Chairman.

REPORT OF THE COMMITTEE ON GRIEVANCES.

The following report was adopted by the Association:

Your Committee on Grievances, which has had under consideration the case of D. A. Gaumnitz, who owns and operates the Northwestern Hog Cholera Serum Manufacturing Company, which was fined for violating the law governing the manufacture and shipment of virus, serum, etc., begs to report as follows:

That after due investigation of complaint against D. A. Gaumnitz on account of violation of Federal regulations governing shipment of serum, it is the opinion of this Committee that circumstances connected with this violation do not jeopardize his membership in this Association.

Your Committee on Grievances, which had under consideration the complaint of Dr. Allen A. Foster, Secretary of the Texas Veterinary Medical Association, regarding the appointment of W. T. Christman as State Veterinarian of Texas, begs to submit the following report:

It is the sense of this Committee that it is deemed inadvisable to recommend either of the plans submitted to this Committee as suggested by the Secretary of the Texas Veterinary Medical Association.

This Committee, however, does unequivocally recommend that the shipments of all live stock from Texas and all other states comply thoroughly with requirements of such states to which shipments are destined.

B. F. DAVIS, E. P. FLOWER, J. G. WILLS.

REPORT OF THE COMMITTEE ON UNIFORM REGULATIONS FOR THE CONTROL OF FOOT-AND-MOUTH DISEASE.

1. It is the sense of this Association that the Federal regulations for the control and eradication of foot-and-mouth disease shall be recognized by each and every state as the standard method of controlling and eradicating foot-and-mouth disease in the United States.

2. We further specifically recommend that all susceptible live stock infected with or exposed to foot-and-mouth disease should be forthwith slaughtered and buried in accordance with regulations of the Bureau of Animal Industry.
3. It is further the sense of this Association that all states should comply with the Federal regulations and co-operate to the fullest extent with the Federal authorities in the control of foot-and-mouth disease within their borders.

4. [Recommendation No. 4 of the Committee was not adopted.]

5. We recommend that no state shall take such action as will in any way interfere with any movement of live stock in transit across such state if shipments are moving in accordance with regulations of the Bureau of Animal Industry.

6. This Association emphatically condemns all attempts at state legislation or personal action to interfere with the Federal regulations now in force for the control and eradication of foot-and-mouth disease.

PETER F. BAHNSEN,
O. E. DYSON,
C. M. HARING,
J. I. GIBSON,
WARD GILTNER.

REPORT OF DELEGATES TO AMERICAN NATIONAL LIVE STOCK ASSOCIATION MEETING, DENVER, JAN. 20, 21 AND 22, 1914.

At the seventeenth annual meeting of this Association W. N. Waddell of Texas, B. F. Davis, Wyoming, and your Secretary were appointed delegates to represent this Association at above meeting.

We are pleased to report that your representatives met with very hearty reception and positive assurance from the executive of this, the largest live stock organization in the world, that they will be pleased to co-operate closely with us on all live stock sanitary matters.

Our work at the Denver meeting crystallized in their resolution No. 22, as follows:

"WHEREAS, the United States Live Stock Sanitary Association is now recognized by Federal and state governments of the United States as a powerful actor in the improvement of live stock sanitary laws and regulations, both Federal and state; and

"WHEREAS, said Association has officially expressed a desire to co-operate with the American National Live Stock Association in the work of improving laws and regulations affecting intrastate movements of live stock; and

"WHEREAS, said Association has in attendance at this convention two official delegates; be it

"RESOLVED, that the American National Live Stock Association, in convention assembled, indorses the work of the United States Live Stock Sanitary Association, and that the President of this Association is hereby requested to designate two delegates from this Association to attend the 1914 meeting of the United States Live Stock Sanitary Association."

J. J. FERGUSON,
B. F. DAVIS.
REPORTS OF STATE LIVE STOCK SANITARY OFFICIALS.

Kentucky.

TABULATED REPORT ON FOOT-AND-MOUTH DISEASE.

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<th>Value of cattle</th>
<th>Hogs</th>
<th>Value of hogs</th>
<th>Burial expense</th>
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<td>53.00</td>
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<td>Dec 1</td>
<td>Dec 1</td>
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<td>Scott</td>
<td>2</td>
<td>14</td>
<td>4,563.00</td>
<td>120.00</td>
<td>Dec 4</td>
<td>Dec 13</td>
<td>Dec 10</td>
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<td>Shelby</td>
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<td>35</td>
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<td>Nov 17</td>
<td>Nov 22</td>
<td>Jan 2</td>
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<tr>
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<td>48</td>
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<td>Dec 20</td>
<td>Jan 9</td>
<td>Feb 3</td>
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<td>Meade</td>
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<td>Dec 2</td>
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<td>1,224.00</td>
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<td>Dec 4</td>
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<td>Jan 5</td>
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<td>Totals</td>
<td>46</td>
<td>819</td>
<td>36,863.15</td>
<td>2,303.90</td>
<td>1,492.85</td>
<td>661.24</td>
<td>Nov 9</td>
<td>Jan 9</td>
<td>Feb 3</td>
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</tbody>
</table>

S. F. MUSSELMAN, State Veterinarian.

Louisiana.

Respecting new legislation, we have the pleasure to report that the last Legislature increased our appropriation fifteen thousand dollars per annum; five thousand dollars additional per annum for tick eradication and ten thousand dollars additional for hog cholera serum production. This additional fund having been available for the past six months has enabled us to construct a modern, sanitary hog cholera serum laboratory and with such facilities we expect to be able to manufacture sufficient of this product to supply the demands of the swine owners of this state.

Tick eradication is enthusiastically advocated over the entire state and we expect, during the current season, to carry on the work in a systematic or compulsory way in ten parishes in co-operation with the Federal authorities. In addition to these ten parishes, nine others have made appropriations to construct the necessary number of vats in each ward in the parish and will begin work in a voluntary way as soon as possible. At present we have three parishes released from quarantine and there is no doubt, due to the general approbation with which this subject is being received, and the favorable agitation of same, that we will receive an increased appropriation at the hands of the next Legislature to rapidly carry on the work to a successful termination.

The importation of all live stock into this state must be accompanied by a certificate of inspection given by a qualified veterinarian, endorsed by the Live Stock Sanitary Board or State Veterinarian of the state in which shipment originates, or certificate given by a Bureau of Animal Industry inspector at least twenty-four hours preceding the shipment of such live stock. Additionally, we require that all cattle shipped into this state for breeding and dairy purposes be accompanied by a tuberculin test chart showing their freedom from tuberculosis.

The State Live Stock Sanitary Board is at the head of tick eradication in the state and it is through the co-operation of this Board with the Federal Bureau of Animal Industry that this work is being systematically carried on for the benefit of our cattle owners.

LOUISIANA STATE LIVE STOCK SANITARY BOARD,

E. PEGRAM FLOWER, D.V.S.,
Secretary and Executive Officer.
Montana.

Our annual report gives a complete report of the sanitary control work in Montana.

To supplement the report on foot-and-mouth disease the total number of animals destroyed is as follows:

<table>
<thead>
<tr>
<th>Kind of Animal</th>
<th>Number Destroyed</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>1,408</td>
<td>$64,551.96</td>
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<tr>
<td>Bucks</td>
<td>218</td>
<td>2,312.00</td>
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<tr>
<td>Lambs</td>
<td>17</td>
<td>55.25</td>
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<td>3</td>
<td>15.00</td>
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<tr>
<td>Swine</td>
<td>11</td>
<td>126.00</td>
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</table>

1,657 $67,060.21

W. J. BUTLER,  
State Veterinary Surgeon.

Nevada.

We have had no foot-and-mouth disease in this state. Early in November we established a rather drastic quarantine, rigidly restricting movements of live stock into and through the state in an endeavor to prevent the introduction of foot-and-mouth disease. Our quarantine is still in existence with slight modifications. We shall modify it from time to time as it appears to us the situation warrants, but our idea is to restrict live stock shipments very materially until we have the assurance that foot-and-mouth disease is either eradicated, or thoroughly under control.

In regard to other contagious and infectious diseases of live stock, the situation in Nevada is normal. There are no serious diseases in existence here; that is, the slight outbreaks that occur in any live stock country, from time to time, are being effectually handled so that the situation is, as I stated above, a normal one.

W. B. MACK,  
Chairman, State Quarantine Board.

North Dakota.

Four hundred and fifteen horses have been destroyed and 1,055 horses quarantined for glanders. Four thousand five hundred and fifty-seven cattle have been tuberculin tested and 214 destroyed for tuberculosis. Twelve thousand five hundred and eighty-five horses have been tested and 484 destroyed for dourine, every positive reactor found having been destroyed.

Hog cholera has been prevalent and three times the amount of anti-hog-cholera serum has been used during the past year, compared with the previous year. Reports indicate that the loss from cholera has decreased. The use of hog cholera virus is prohibited in this state.

A shipment of cattle from Chicago destined to Montana was unloaded and fed at Mandan stock yards. One animal died and four were reported sick. Dr. E. Mackey, an Assistant State Veterinarian, was called and made an examination, reporting that the symptoms simulated foot-and-mouth disease. The shipment was permitted to move towards destination and was held at Glendive, Montana. The disease proved to be foot-and-mouth disease and spread rapidly through the shipment. We were informed that the animals were destroyed. The Mandan yards were quarantined and thoroughly disinfected.

243
A shipment of cattle from Chicago destined to Spokane, Wash., was unloaded and fed at the Jamestown stock yards. It was reported that these animals developed foot-and-mouth disease at destination. The Jamestown yards were also quarantined.

All shipments of cattle arriving in this state after the outbreak of foot-and-mouth disease were quarantined and held under observation. No foot-and-mouth disease has developed up to this time. All railway cars within this state at time of outbreak that had been used for stock were cleaned and disinfected.

We are not admitting at this time any cattle, sheep or swine from any of the states that have been under quarantine for this disease.

W. F. CREWE, State Veterinarian.

Oregon, thus far, has not been subjected to an infection of foot-and-mouth disease and in view of the precautionary measures that we have carried out, I trust that infection may be avoided. All of our public stock yards and railroad corrals have been thoroughly cleaned and disinfected. All of the cars used for the transportation of live stock have been cleaned and disinfected, and at the present time no cars are permitted to be used for housing or hauling live stock until they have been cleaned and disinfected.

While it is altogether possible that these measures were unnecessary so far as the actual avoidance of an infection of foot-and-mouth disease was concerned, we feel we are already receiving good results from a considerably lessened amount of hog cholera. We attribute this fact to the cleaning and disinfecting of stock cars and public stock yards.

Hog cholera has not been reported in this state for a period of some three months and at this time we believe the State of Oregon to be proportionately freer from hog cholera than any state in the Union.

Our live stock sanitary work has consisted largely of the tuberculin testing of dairy and breeding cattle, and in the past sixteen months we have tested some thirteen thousand animals, with nine hundred and eight reactions and one hundred and sixteen suspect reactions. Our state laws provide indemnity in the amount of $25 for grade cattle over two years of age and $10 for grade animals under two years of age, and one-half additional is paid for registered animals of the same ages.

Some twenty-three hundred horses have been tested for glanders, with eighteen reacting animals and nine suspect animals.

Outside of our hog cholera work, which now has apparently been placed under control, rabies of coyotes and dogs has given us much concern. The infection is quite prevalent in some of the range counties and reports of a considerable number of animals affected have been made to this office.

Blackleg has been of less frequent occurrence than in former years, due no doubt to a better understanding and a more complete reporting of cases.

Hemorrhagic septicemia in cattle, sheep and hogs has been of quite frequent occurrence this past year.

Johne's disease has been diagnosed in two herds.

Borna sickness, or enzootic cerebro-spinal meningitis, has been of quite frequent occurrence throughout the mountain range districts of the state.

Measles in cattle and sheep have been of infrequent occurrence, due
no doubt to the better understanding and diagnosis of this parasitic complaint.

Infectious abortion of cattle continues to assume a matter of very grave importance to the dairy industry. We have received uniformly good results from the use of methylene blue (medicinal), as outlined by Dr. F. A. Rich, Veterinarian to the Vermont Experiment Station.

Infectious vaginitis of cattle continues to be a source of much concern to the dairy owners and is doubtless, in many respects, closely associated with the disease infectious abortion.

Our work in connection with sheep scab has been of increased importance this year, owing to a range infection that we received in one of our large eastern Oregon range districts. So far the disease is thought to be completely under control and after a spring dipping of a few herds we trust that the infection may be completely eradicated. As a further precautionary matter the Governor of the state has issued a quarantine proclamation prohibiting the entrance of range bucks into Oregon except they be dipped twice upon arrival.

Other ailments of sheep are confined practically to diseases and complaints arising from the internal infestations with certain parasites peculiar to the western coast region. Among these ailments may be mentioned liver fluke, parasitic gastric catarrh, and verminous bronchitis. All of these ailments are of varying importance due largely to climatic conditions.

The general health of the live stock of the state has been uniformly good and no widespread infection has been reported this past year.

W. H. LYTLE, State Veterinarian.

Utah.

Our method of handling the foot-and-mouth disease problem has been that of so many other states, excluding all shipments of cattle, sheep, swine and other ruminants, unless inspected by United States officials, certified to by them and shipments made under their direct personal supervision. In a few instances animals have been shipped in sealed cars, this being done by the Government officers; feeding and watering occurred without unloading, while they were in transit.

Our legislative body is now in session and a number of laws relating to the live stock industry of this state are before them. What the results of their legislative acts will be I am unable to say.

We have prosecuted the work of stamping out tuberculosis and paid $25 per head for condemned animals. These have been destroyed by incineration or burial in unslaked lime.

Glanders, cerebro-spinal meningitis and blackleg have been found in various districts, but through prompt handling of the outbreaks and using proper methods, they have not been serious.

A. CARRINGTON YOUNG,
Chief Inspector.

Vermont.

In regard to the foot-and-mouth epidemic would say that so far we have been very fortunate in not having had a single case in this state. With the outbreak so near to us I think that the people of Vermont should be congratulated that the disease has not gotten a foothold within our borders. I attribute the fact that we have been able to keep out this disease to the early action taken to control the importation of live stock, and to the co-operation this department has received from breeders and others.

245
When I was notified of the outbreak in Illinois, I at once called in all permits issued to bring in cattle and horses. After consulting with the Governor of Vermont, we decided to refuse permission for any live stock to come in from infected states. As the infection spread, and was reported in the adjoining states of New Hampshire and Massachusetts, it was thought best to place an embargo on all live stock from all states. The express and railroad companies were notified not to accept any shipments of live stock without permission. When the disease was under control we began issuing permits to admit poultry and pet stock, subject to rules of disinfection. Shipments of horses have been allowed to enter the state provided the horses were walked through a disinfecting solution and the car disinfected before loading. No cattle, sheep or other ruminants, or swine, have been allowed to come into the state from any section under quarantine. It is my sincere hope that we will be able to keep the State of Vermont free from the disease, and I trust that the time is not far distant when it will be eradicated from all other states.

Testing for tuberculosis has been going on as usual. I do not think that I am making too broad a statement when I say that I believe Vermont to be as free from this disease as any state in the Union, and it is my opinion that we have the best laws for the protection of the breeder and the buyer.

F. L. DAVIS,
Vermont Live Stock Commissioner.

Washington.

During the month of November we experienced an outbreak of foot-and-mouth disease at Spokane, Wash. There were one hundred and two animals involved, which were immediately destroyed under the supervision of this office. Since this destruction no additional cases have developed.

H. T. GRAVES,
Acting Commissioner, Agriculture,

West Virginia.

Our appropriation in this state has been $5,000 a year for the control and eradication of live stock diseases, but on account of the foot-and-mouth disease quarantine that we have been compelled to maintain we have exceeded our appropriations $379.32.

No cases of foot-and-mouth disease. Total expenses incident to quarantine, to date, $2,598.79.

Hog cholera serum furnished county agents and veterinarians, $1,762.59. Expenses incident to hog cholera eradication and miscellaneous diseases investigated and treated, $1,017.94. Total expenses from July 1, 1914, to January 22, 1915, $5,379.32.

J. G. TILTON,

Wisconsin.

Thirty days have now elapsed since the last discovered case of foot-and-mouth disease was buried. By the time of the meeting the second inspection will be complete on all area known to have been infected and the surrounding area which has been prescribed by the Bureau of Animal Industry.
The area now in quarantine is the lower two tiers of townships in Dane County, all of Rock, Walworth, Racine, Waukesha, Jefferson, Dodge, Lincoln, Langlade, three townships in Washington County, and two townships in Green County. Jefferson County is in the modified area and Waukesha is expected to be placed in the modified area at this writing; in fact, all territory in Wisconsin is expected to be in modified area at the end of this month, unless any new cases are discovered in the meantime.

Very hearty co-operation has been found among the people, veterinarians, and also between the Bureau of Animal Industry and the state departments.

O. H. ELIASON,
State Veterinarian.

Wyoming.

FOOT-AND-MOUTH DISEASE.

Quarantine effective on and after November 7, 1914, not yet modified nor amended. No infected nor exposed animals have entered the State of Wyoming. No reason to suspect. A number of investigations have been made as the results of reported outbreaks; no foundation for such reports. The Government and state inspectors each inspected one herd that originated in Wisconsin on or about November 1, shipped to a point in Nebraska and trailed into Wyoming. Examination proved that the cattle were healthy.

DOURINE.

With Government co-operation the state tested 6,357 stallions and mares for doirine. Of this number, twenty-four stallions and 186 mares were infected with the disease. All infected animals were destroyed. The total appraised value was $21,656. Federal indemnity, $6,405.32; state indemnity, $7,942.61. State quarantine was placed on the premises where infection was known on December 8, 1913. Quarantine was removed October 8, 1914.

GLANDERS.

In the years 1913 and 1914, forty-one head of horses were destroyed on account of being infected with this disease, in the State of Wyoming. Of the total number destroyed ten were clinical cases (seven of which were taken from one railroad grading outfit), three were taken from interstate shipments, and the balance were reactors showing no clinical lesions.

HOG CHOLERA.

This disease proved to be affecting hogs in no less than seven counties of Wyoming in the past two years. I am of the opinion that our sources of infection are as follows:

- Infected railroad cars that have previously hauled infected hogs, and which were not immediately afterward cleaned and disinfected, into which healthy hogs were loaded, and as a result contracted the disease.
- The feeding of slop gathered from cities or towns, contaminated with hog cholera infected meat trimmings.
- Shelled corn imported from Nebraska, contaminated at point of origin.

In one instance I believe stock cattle, originating upon the premises of an owner whose hogs were affected with cholera, caused the disease to be imported into Wyoming.

I am opposed to the simultaneous treatment, at least for the present.
CATTLE SCABIES.

During the years 1913 and 1914 approximately 334,684 head of cattle were inspected for scabies; .667 per cent were found to be infected. As a result of this infection about 130,000 were dipped under state or Federal supervision. The extent of the infection is being gradually reduced each year.

TUBERCULOSIS.

This disease is practically unknown in our native cattle. During the past two years ninety-seven head of cattle were condemned on account of having reacted to the tuberculin test. These cattle originated in the states of Illinois, Wisconsin and New York. Of the eighty slaughtered under Federal supervision, twenty-six were condemned and tanked; all showed marked lesions, with the exception of one head. The greater part of these condemned cattle originated in the State of Wisconsin. Said shipments were accompanied by tuberculin tests prepared by Dr. P. L. Robinson, Beloit, Wis., and Dr. E. G. Thom, Bristol, Wis. (license No. 623). Dr. A. Tyler tested the Illinois cattle and Dr. Jos. Cogswell of Orwell, N. Y., tested the New York shipment.

The total valuation of all live stock in Wyoming, with the exception of sheep and goats, is $65,406,000. The contingent of the office of State Veterinarian is $30,000 for two years.

B. F. DAVIS,
State Veterinarian.
MEMBERS—1915.

Allen, Dr. L. J., Fort Worth, Tex.
Anderson, Mr. Wm. Penn, Kansas City, Mo.
Archibald, Dr. R. A., Oakland, Cal.
Atwood, Dr. Frank G., New Haven, Conn.
Atwood, Dr. G. C., New Haven, Conn.
Avery, Mr. J. H., Fort Worth, Tex.
Bahnsen, Dr. P. F., Atlanta, Ga.
Baker, Dr. A. H., Chicago, Ill.
Bayard, Mr. E. S., Pittsburgh, Pa.
Bazley, Dr. V. S., Decatur, Ill.
Becker, Dr. H. C., Chicago, Ill.
Beer, Dr. Henry J., Blue Island, Ill.
Behnke, Dr. A. E., Milwaukee, Wis.
Bolser, Dr. F. A., New Castle, Ind.
Boyd, Prof. W. L., St. Anthony Park, Minn.
Brimhall, Dr. S. D., Chicago, Ill.
Brinker, Mr. J. G., Amarillo, Tex.
Brooks, Mr. F. S., Kansas City, Mo.
Brown, Mr. L. F., Galesburg, Ill.
Bugbee, Dr. Clinton H., Kansas City, Mo.
Burcham, Mr. D. H., Kansas City, Kan.
Bushnell, Fred F., Harvard, Ill.
Butin, Mr. Geo. E., Kansas City, Mo.
Butler, Dr. W. J., Helena, Mont.
Campbell, Dr. D. M., Evanston, Ill.
Canfield, Mr. Thos. H., Lake Park, Minn.
Cary, Dr. C. A., Auburn, Ala.
Chandler, Dr. T. W., Davenport, Ia.
Chittick, Mr. Hugh, Sao Paulo, S. A.
Cock, Dr. Frank, Pierre, S. D.
Cohen, Mr. Mat, Lexington, Ky.
Cohenour, Dr. H. H., Bismarck, N. D.
Collett, Mr. Geo. A., Kansas City, Mo.
Connaway, Dr. J. W., Columbia, Mo.
Cotton, Dr. Chas. E., Minneapolis, Minn.
Craig, Dr. R. A., Lafayette, Ind.
Crewe, Dr. W. F., Bismarck, N. D.
Crocker, Mr. F. C., Fillley, Neb.
Dalrymple, Dr. W. H., Baton Rouge, La.
Davis, Dr. B F., Cheyenne, Wyo.
Davis, Mr. F. L., White River Junction, Vt.
Dawson, Mr. Berkley, Shattuck, Okla.
Dawson, Dr. Chas. F., Jacksonville, Fla.
DeVine, Dr. J. F., Goshen, N. Y.
Dorset, Dr. M., Washington, D. C.
Downing, Dr. Tom, Washington, Ia.
Dunphy, Dr. Geo. N., Lansing, Mich.
Dyson, Dr. O. E., Springfield, Ill.
Edwards, Prof. S. F., Lansing, Mich.
Elchhorn, Dr. Adolph, Washington, D. C.
Elder, Dr. G. D., Douglass, Kan.
Ellis, Dr. O. H., Madison, Wis.
Ensign, Mr. E. D., Bryan, Ohio.
Erickson, Dr. O., Pelican Rapids, Minn.
Eves, Mr. H. P., Wilmington, Del.
Evvard, Mr. John M., Ames, Iowa.
Ferguson, Mr. John J., Chicago, Ill.
Ferguson, Mr. T. H., Lake Geneva, Wis.
Fischer, Dr. Paul, Columbus, Ohio.
Flanagan, Dr. D. J., Chicago, Ill.
Fletcher, Mr. F. C., Kansas City, Mo.
Flocken, Prof. Chas. F., St. Anthony Park, Minn.
Flowe, Dr. B. B., Raleigh, N. C.
Flower, Dr. E. Pegram, Baton Rouge, La.
Forbes, Dr. E. R., San Angelo, Tex.
Fox, Mr. F. C., Amarillo, Tex.
Gaumnitz, Prof. D. A., South St. Paul, Minn.
Gibson, Dr. J. I., Des Moines, Iowa.
Gilliland, Dr. S. H., Marletta, Pa.
Glitner, Dr. Ward, East Lansing, Mich.
Gingery, Dr. J. B., Columbia, Mo.
Godsall, Dr. F. W., Kewanee, Ill.
Good, Prof. E. S., Lexington, Ky.
Gow, Dr. R. M., Fayetteville, Ark.
Graff, Mr. Charles, Bancroft, Neb.
Graham, Dr. G. G., Kansas City, Mo.
Graham, Dr. Robt., Lexington, Ky.
Greeder, Dr. Herman, Milwaukee, Wis.
Griffith, Dr. J. W., Cedar Rapids, Ia.
Grimes, Dr. Robt., Kansas City, Kan.
Gross, Dr. Herman, Sisseton, S. D.

Hadley, Prof. F. B., Madison, Wis.
Halladay, Mr. H. H., Clinton, Mich.
Hallman, Dr. E. T., East Lansing, Mich.
Halverson, Dr. H. M., Yankton, S. D.
Haring, Dr. C. M., Berkeley, Cal.
Hartwig, Dr. A. H., Watertown, Wis.
Hasenmiller, Dr. Fred, Eldridge, Ia.
Haslam, Prof. Thos. P., Manhattan, Kan.
Hastings, Dr. E. G., Madison, Wis.
Hawkins, Dr. A. M., National Stock Yards, III.
Hecker, Dr. Frank, Birmingham, Ala.
Heide, Mr. B. H., Chicago, Ill.
Hollingworth, Dr. W. G., Utica, N. Y.
Henderson, Dr. A. M., Aurora, Ill.
Hernsheim, Dr. J. T., Chicago, Ill.
Herring, Mr. C. T., Amarillo, Tex.
Hershey, Dr. S. E., Charleston, W. Va.
Hickman, Dr. R. W., Washington, D. C.
Hicks, Dr. Thos., Milbank, S. D.
Hoffman, Dr. Wm., Kansas City, Kan.
Holmes, Dr. W. B., Springfield, Ill.
Hoskins, Dr. H. Preston, St. Paul, Minn.
Houck, Dr. U. G., Washington, D. C.
Houk, Dr. S. E., National Stock Yards, Ill.
Hoverstad, Mr. T. A., Minneapolis, Minn.
Hughes, Dr. Joseph, Chicago, Ill.
Humphreys, Dr. John S., Chula, Mo.

Ingram, Dr. Frank A., Hartford, Conn.

Jaffray, Dr. D. S., Jr., Chicago, Ill.
Jaffray, Mr. David S., Lisle, Ill.
Jessen, Dr. Julius A., Lisle, Ill.
Johnson, Mr. G. A., Sioux City, Ia.
Joly, Dr. A., Waterville, Maine.
Jones, Dr. P. K., Pittsburgh, Pa.
Jucknick, Dr. Paul, South Omaha, Neb.

Kaupp, Dr. B. F., West Raleigh, N. C.
Keane, Dr. Chas., Sacramento, Cal.
Ketchum, Dr. F. D., South St. Paul, Minn.
Kierman, Dr. J. A., Birmingham, Ala.
Kigin, Dr. L. C., Lincoln, Neb.
King, Walter E., Detroit, Mich.
Kingma, Dr. R., Chicago, III.
Kinsley, Dr. A. T., Kansas City, Mo.
Kinsley, Dr. Frn., Ia.
Kouns, Mr. C. W., Topeka, Kan.
Krey, Dr. Theo. J., Detroit, Mich.

Lambrechts, Dr. T., Montevideo, Minn.
Leech, Dr. G. Ed., Winona, Minn.
Linch, Dr. Chas., Albany, N. Y.
Lipp, Dr. C. C., Brookings, S. D.
Lively, Mr. D. O., San Francisco, Cal.
Logan, Dr. J. A., Oakes, N. D.
Logan, Dr. J. W., Kansas City, Kan.
Longley, Dr. Otis A., Fresno, Cal.
Lowe, Mr. C. D., Atlanta, Ga.
Lowery, Mr. C. A., Springfield, Ill.
Lucas, Dr. C. E., Olney, Ill.
Lucky, Dr. D. F., Columbia, Mo.
Lyman, Dr. R. E., East Lansing, Mich.
Lytle, Dr. W. H., Salem, Ore.
McDowell, Dr. J. J., Aberdeen, S. D.
McGilvray, Dr. J. T., Sioux Falls, S. D.
McNeil, Dr. John H., Sao Paulo, S. A.
MacIntosh, Dr. R. D., Chicago, Ill.
Mack, Mr. W. B., Reno, Nev.
MacKellar, Dr. Wm. M., San Diego, Cal.
Marshall, Dr. C. J., Harrisburg, Pa.
Marsteller, Prof. R. P., College Station, Tex.
Martin, Dr. W. J., Kankakee, Ill.
Matta, Dr. J. C., National Stock Yards, Ill.
Mauldin, Dr. C. E., Jeanerette, La.
Mayo, Dr. N. S., Ravenswood, Ill.
Melvin, Dr. A. D., Washington, D. C.
Meyer, Dr. K. F., Berkeley, Cal.
Miller, Dr. A. W., Chicago.
Miller, Dr. Walter E., Abingdon, Ill.
Mohler, Dr. John R., Washington, D.C.
Moore, Harry C., Indianapolis, Ind.
Moore, Dr. V. A., Ithaca, N.Y.
More, Dr. J. W., Galesburg, Ill.
Morris, Dr. Harry R., Omaha, Neb.
Munce, Dr. T. E., Harrisburg, Pa.
Murphy, Dr. B. W., St. Joseph, Mo.
Musselman, Dr. S. P., Frankfort, Ky.
Myers, Dr. Willis A., Wenona, Ill.

Nelson, Dr. Amos F., Indianapolis, Ind.
Netherton, Mr. E. J., St. Joseph, Mo.
Nichols, Dr. P. K., Port Richmond, N.Y.
Nighbert, Dr. E. M., Atlanta, Ga.
Nunn, Dr. Henry, McMinnville, Ore.

Oesterhaus, Dr. J. H., Kansas City, Mo.
O'Reilly, Dr. L. J., Merrill, Wis.

Palais, Dr. Jas. B., Amherst, Mass.
Palmer, Dr. Donald B., St. Paul, Minn.
Palmer, Dr. Herbert F., Philadelphia, Pa.
Patterson, Dr. E. E., Detroit, Mich.
Patterson, Mr. R. M., Chicago, Ill.
Pecham, Mr. N. Howard, Boston, Mass.
Peters Doctor A. T., Peoria, Ill.
Petersen, Dr. Phineas, Lindborg, Kan.
Phefes, Jeffry O., Jr., Hartford, Conn.
Pierce, Dr. Benj. D., Springfield, Mass.
Pierce, Dr. Chas., Elgin, Ill.
Plummer, Mr. O. M., North Portland, Ore.
Presler, Dr. H. A., Fairbury, Ill.

Quintman, Dr. E. L., Chicago, Ill.

Ramsay, Dr. R. A., Washington, D.C.
Ranck, Dr. E. M., Agricultural College, Miss.
Ransom, Dr. B. H., Washington, D.C.
Rasmussen, Dr. J. C., Wyandet, Ill.
Ravenel, Dr. Mazyck P., Columbia, Mo.

Reedy, Dr. James E., Tillamook, Ore.
Reigel, Dr. John, Glenolden, Pa.
Reynolds, Dr. M. H., St. Anthony Park, Minn.
Riddle, Mr. Taylor, Topeka, Kan.
Rives, Dr. Robt., National Stock Yards, Ill.
Roberts, Dr. G. H., Indianapolis, Ind.
Rockwell, Dr. A. M., Eleanor, Ill.
Ryan, Dr. John T., Chicago, Ill.
Ryder, Dr. H. R., Chicago, Ill.

Schern, Prof. Kert, Ames, la.
Schmitt, Dr. Chas., Dodgeville, Wis.
Schoenleber, Dr. F. S., Manhattan, Kan.

Schreck, Dr. Oscar, New Haven, Conn.
Schroeder, Dr. E. G., Bethesda, Md.
Schuh, Dr. H. L., Grand Rapids, Mich.
Schumacher, Dr. Wm., Durango, Colo.
Schwarz, Dr. H. R., Springfield, Ill.
Selby, Dr. O. C., Pierre, S.D.
Shanley, Mr. E. J., Ottawa, Ill.
Sheldon, Dr. S., Kansas City, Mo.
Sihler, Dr. C. J., Kansas City, Kan.
Smith, Mr. Clarence E., Greenville, S.C.
Snell, Dr. Noble R., Saginaw, Mich.
Spiller, Mr. E. B., Fort Worth, Tex.
Stange, Dr. C. H., Ames, la.
Steddom, Dr. R. P., Washington, D.C.
Stevens, Dr. C. H., Stevensville, Mont.

Stewart, Dr. S., Kansas City, Mo.
Stouder, Dr. K. W., Ames, la.
Stouder, Mr. M. R., Newton, Ta.
Stringer, Dr. N. I., Stewartville, Minn.
Sullivan, Dr. E. M., Milwaukee, Wis.
Sullivan, Dr. W. A., Twin Falls, Ida.

Taylor, Dr. C. H., DeKalb, Ill.
Thomson, Dr. H., Newman Grove, Neb.
Thrower, Dr. John D., Kansas City, Kan.
Timson, Mr. Chas. E., Chicago, Ill.
Tomlinson, Mr. T. W., Denver, Colo.
Torrance, Dr. Fred, Ottawa, Can.
Treacy, Dr. R. H., Bismarck, N.D.
Turner, Mr. Avery, Amarillo, Tex.
Udall, Dr. D. K., Ithaca, N. Y.
Underwood, Dr. J. R., Des Moines, Ia.
Van Es, Dr. L., Agricultural College, N. D.
Van Hagen, Mr. Geo., Barrington, Ill.
Waddell, Mr. W. N., Ft. Worth, Tex.
Wallace, Mr. W. A., Fort Worth, Tex.
Walkley, Dr. S. J., Milwaukee, Wis.
Ward, Dr. S. H., St. Paul, Minn.
Way, Dr. Cassius, New York City, N. Y.
Weaver, Dr. P. V., Glen Cove, N. Y.
Wells, Dr. T. G., Arthur, Ill.
Wende, Dr. H. S., Tonawanda, N. Y.
White, Dr. David S., Columbus, Ohio.

White, Dr. Geo. R., Nashville, Tenn.
White, Dr. Henry A., Wyoming, Ill.
White, Dr. John L., Chicago, Ill.
White, Dr. Timothy P., Oklahoma City, Okla.
White, Dr. V. C., Boise, Ida.
Whiting, Mr. Rex A., Lafayette, Ind.
Wiggs, Mr. Chas. F., Billings, Mont.
Wight, Dr. A. E., Little Rock, Ark.
Wills, Dr. J. G., Albany, N. Y.
Wilson, Dr. R. H., Rochester, Mich.
Wright, Mr. L. A., Columbus, Wis.

Yard, Dr. W. W., Denver, Colo.
Zimmerman, Mr. D. B., Somerset, Pa.