PROCEEDINGS

Thirty-third Annual Meeting

of the

United States Live Stock Sanitary Association

HOTEL LASALLE, CHICAGO, ILL
December 4-5-6, 1929
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of the

United States Live Stock Sanitary Association

Reprint from Journal of the American Veterinary Medical Association,

HOTEL LASALLE, CHICAGO, ILL.

December 4-5-6, 1929
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers and Committees, 1929-1930</td>
<td>vi-viii</td>
</tr>
<tr>
<td>First Session, Wednesday Morning, December 4, 1929</td>
<td></td>
</tr>
<tr>
<td>Opening Address—Morris Fishbein</td>
<td>283</td>
</tr>
<tr>
<td>Address—President C. G. Lamb</td>
<td>290</td>
</tr>
<tr>
<td>Report of Secretary-Treasurer—O. E. Dyson</td>
<td>297</td>
</tr>
<tr>
<td>Second Session, Wednesday Afternoon, December 4, 1929</td>
<td></td>
</tr>
<tr>
<td>Buying Replacement Cows Free from <em>Brucella Abortus</em> Infection—</td>
<td></td>
</tr>
<tr>
<td>John G. Hardenbergh</td>
<td>298</td>
</tr>
<tr>
<td>The Influence of Nutrition on Contagious Cattle Abortion—F. B. Hadley</td>
<td></td>
</tr>
<tr>
<td>and M. C. Hawn</td>
<td>308</td>
</tr>
<tr>
<td>The Significance of Disease Caused by <em>Bacterium Abortus</em> from the Stand-point of the Agricultural Press—E. M. Harmon</td>
<td>320</td>
</tr>
<tr>
<td>The Relationship of Human and Animal Bruceliasis—H. E. Hasseltine</td>
<td>330</td>
</tr>
<tr>
<td>Report of Committee on Abortion</td>
<td>339</td>
</tr>
<tr>
<td>Third Session, Thursday Morning, December 5, 1929</td>
<td></td>
</tr>
<tr>
<td>Open Session</td>
<td>341</td>
</tr>
<tr>
<td>Pulmonary Edema of Swine—Charles Murray and H. E. Biester</td>
<td>349</td>
</tr>
<tr>
<td>Report of Committee on Swine Diseases</td>
<td>354</td>
</tr>
<tr>
<td>Canadian Meat Inspection—George Hilton</td>
<td>355</td>
</tr>
<tr>
<td>Report of Committee on Unification of Laws and Regulations</td>
<td>362</td>
</tr>
<tr>
<td>Report of Committee on Parasitic Diseases</td>
<td>363</td>
</tr>
</tbody>
</table>
Fourth Session, Thursday Afternoon, December 5, 1929

Present Status of National Cooperative Tuberculosis Eradication Campaign—A. E. Wight ................................................................. 366

The Importance of Bovine Tuberculosis Eradication from an Economic Standpoint. Part I—A. J. Glover ........................................... 374
The Importance of Bovine Tuberculosis Eradication from an Economic Standpoint. Part II—W. T. Spencer ..................................... 380

Vaccination of Calves Against Tuberculosis with Calmette-Guérin Culture, B.C.G.—C. M. Haring, J. Traum, F. M. Hayes and B. S. Henry .............................................. 391

The Sources of Tuberculosis—L. Van Es ........................................ 396

The Pathogenicity for Dogs of Bacilli of Avian Tuberculosis—William H. Feldman .............................................................. 399

Report of Committee on Tuberculosis ........................................... 419

Fifth Session, Friday Morning, December 6, 1929

Clinical Aspects of Human and Animal Rabies—Julius H. Hess ........ 420

Commercial and Economic Aspects of the Inspection of Dressed Poultry by Government Agencies—Roy C. Potts .................................. 432

Merits of Cutaneous Vaccination Against Fowl-Pox—H. J. Stafseth .... 442

Brucella Disease in the Fowl—M. W. Emmel and I. Forest Huddleston 449

A Preliminary Report on the Susceptibility of the Turkey, Pheasant, Pigeon, Duck and Goose to Brucella Disease—M. W. Emmel ...... 452

Report of the Committee on Poultry Diseases .................................. 453

Sixth Session, Friday Afternoon, December 6, 1929

Report of Committee on Nutritional Diseases .............................. 456

Report of the Committee on Miscellaneous Transmissible Diseases .... 465

Report of the Committee on Tick Eradication .............................. 467

Election of Officers ................................................................. 473
Appendices

Report of Meeting of Executive Committee ......................... 477
Report of Committee on Legislation ................................. 478
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Report of the Proceedings
of the
Thirty-third Annual Meeting
of the
United States Live Stock
Sanitary Association

Chicago, Illinois, December 4-6, 1929

WEDNESDAY MORNING, DECEMBER 4, 1929

The opening session of the thirty-third annual meeting of the United States Live Stock Sanitary Association, held at the La Salle Hotel, Chicago, Illinois, was called to order at 10:10 a. m., by President C. G. Lamb.

PRESIDENT LAMB: Gentlemen, during my enforced absence at the last meeting you honored me with election to the office of President and at that time, on account of my absence, I did not have the opportunity to thank you. While I may not have very great esteem for your judgment shown at that time, I do want you to know that I consider this one of the highest honors that can be put upon any veterinarian. I also want you to know that I value it accordingly.

I think, and I have no doubt you think, too, that we are very fortunate and highly honored in being able to listen to the man who will give the opening address, a man whose ability and reputation is known to every one.

I have the honor and the pleasure of introducing Dr. Morris Fishbein, editor of The Journal of the American Medical Association. (Applause)

OPENING ADDRESS

By MORRIS FISHEIN, Chicago, Ill.

Editor of the Journal of the American Medical Association

MR. CHAIRMAN AND MEMBERS:

My very earliest experience in connection with your field was about 1913, when I went out to the Union Stockyards and conducted a series of experiments on iso-agglutination in the lower animals. At that time I made the very intimate acquaintance-ship of 60 cows, 40 swine, 20 sheep, a certain number of monkeys and frogs—the monkeys and frogs not being located at the same place, of course, as the cows, the sheep and the swine.

I discovered at that time that the problems of man were intimately associated with those of the lower animals. I have noticed in my observation of the trend of scientific medicine since that time that the great gap which exists between the study
of the manifestations of disease in animals and the manifestations of disease in man is slowly but quite definitely closing. I think we can conceive of a time in the future when this gap will practically not exist at all, and when it will be realized that the scientific study of pathology and bacteriology and physiology and hygiene and sanitation in relationship to the animal will be considered as a science wholly on a par with the study of the manifestations of disease in man.

Indeed, if anyone were to study critically the program that has been prepared for your organization for this present session, he would realize that already today veterinary science and the sanitation of live stock is one of the most scientific of all of the human studies. It takes into account all of the fundamental sciences that are today considered important for the physician: anatomy, physiology, bacteriology, physics, chemistry, immunology, and all of these other fundamental sciences.

As I have said, there is a great gap between conditions as they existed in 1913 and as they exist today. Of course, you realize as well as I that the real beginning of the study of sanitation in relationship to live stock comes with the period of the enactment of the meat inspection law and the Pure Food and Drugs Act, following the tremendous publication by Upton Sinclair of "The Jungle." The interest manifested by the public in that book, the publicity given to it by Theodore Roosevelt and by others, the work of Harvey Wiley, caused people to turn their attention quite definitely, in a manner never before turned, to the problems of sanitation of food supplies. Since that time this question has loomed constantly in the public eye.

Of course, a great deal of the interest in these problems is associated also with the gradual change that is taking place in the food supply of the American people. There was a time—and it is not more than a quarter of a century ago—when the vast majority of the American people subsisted on a diet which consisted largely of lean meat, potatoes, coffee, syrup and a few cereals. As the prosperity of our country increased and as people began to give greater and greater study to the science of diet, there have been tremendous changes in the food supply. When a person has more money to spend for food, he does not buy more food, but he commences to vary his diet. The fact of the matter is a person cannot eat more food. The most that any person can take into his body per day and get along comfortably is about 3500 calories. There was a time when practically all Americans
ate 3500 calories. Today most Americans eat only 2500 calories per day. They have changed their diet by taking what are known as the necessary food substances, including a careful selection of protein, carbohydrates, fat, mineral salts, and the essential vitamins, and they have sophisticated their diet.

The old cereals that we used to eat, like whole wheat and oatmeal and farina, have changed to package cereals. All sorts of queer things are done to cereals in order to make them palatable and in order to make them appeal to the human taste. They shoot them out of a cannon and mix them up in strange ways, cut them up, irradiate them and do everything in order to accommodate them to the human taste.

In the same way, in the past twenty years, it has been found that many portions of meats which were formerly discarded are now considered quite palatable. That has been the result of education of the public as to the chemistry of the meats themselves, as to their special values from the point of view of the vitamin and mineral salt content. These things represent a great part of the advance of modern science and the application of science to daily life.

As we conceive of nature today, as all scientific men conceive of nature, man represents the highest development of life upon this earth. We conceive of life as beginning somewhere in the prehistoric era with a single-cell animal, an ameba perhaps, crawling out of the primordial ooze in search of the sunlight, and then the gradual development, the synthesis of various lower animals, and emerging from this the human being who is distinguished primarily from the lower animals by the fact that he is able to think and reason for himself in a way that the lower animals do not attempt.

At the very moment when this first ameba came out of the ooze, it is likely that a streptococcus developed in order to live on the ameba. Victor Vaughan, one of our greatest sanitarians and hygienists, said some years ago, in considering the evolution of man and the evolution of disease, that no doubt man was developed in order to be a host for the streptococcus. I think this is a particularly interesting view, since we realize today that there are more than 400 different types of streptococci which adapt themselves in the varied living conditions that they find in the human being.

We commence to conceive of Rosenow's conception of a special selection, by the streptococcus, of the organ in which it
will locate, as a conception almost proved. We commence to realize there is such a thing as bacterial mutation. We realize that evolution goes on constantly, and that the germs and parasites which are constantly with us change their habits and methods of living, and change their diets exactly as man changes his diet and his habits of living.

A streptococcus which has been used to living under a certain oxygen tension, and with a certain type of blood supply, suddenly finds out it can live without oxygen altogether and in a different type of blood supply. A streptococcus which has been used to living at the root of a tooth suddenly finds out that the kidney offers a very good place for himself to live, and the streptococcus, carried by the blood, localizes in the kidney and sets up a kidney disturbance. Hence, it is that the science of medicine and sanitation and hygiene, as applied to both man and to animals, is not in any sense of the word a completed science. The time will never come when there will be no need for physicians, no need for veterinarians and no need for science of living tissue, for the simple reason that the evolution of disease goes on constantly. We hear today of diseases affecting animals and man which we did not hear of twenty years ago. Diseases suddenly loom into prominence, and the historians who look over the scene say, “Is this a new disease or did it exist twenty-five years ago and we had no knowledge of it?” Of course, the actual fact of the matter is there were sporadic cases, occasional cases, of all of these unusual diseases at an earlier period, but the changing conditions of life, the changing conditions of transportation and intercommunication, the changes in the human diet and in human living conditions generally, have made these new diseases assume new importance.

This is particularly important, let us say, in relationship to the respiratory diseases. The respiratory diseases are considered today the greatest cause of disability of any of the diseases that afflict mankind. More people lose time from work by respiratory diseases than from any other cause. Well, there were, of course, respiratory diseases two hundred and three hundred and three thousand years ago, but the reason the respiratory diseases loom large today is the fact that human beings live today, in the United States, in the proportion of 51 per cent in the city as contrasted with 49 per cent in the rural districts. When the people from the rural districts move into the cities they begin to do everything in the form of mass action. They attend football
games in crowds of 120,000. They go to movies in crowds of 4,000 and 5,000. They go to baseball games in crowds of from 15,000 to 50,000. They mass themselves in department stores. There are no such things any more as homes. They are merely tremendous barracks where thousands of families live under a single roof, closely communicating in their daily lives, going up and down massed together in elevators, eating in crowded restaurants. In fact, Doctor Coffman, president of the University of Minnesota, said that today there is no such thing as a home. A home is merely a place in front of a garage. (Laughter)

With that situation, you can see that the entire history of disease is changed, as the living conditions of human beings change among us.

As we survey the animal diseases that afflict mankind, and as I have looked over previous transactions of your organization, I have seen that you have had this, year after year, from all of your medical speakers—I find that each year a medical speaker arises before this or a similar organization and carefully lists all of the diseases that afflict animals and likewise afflict man and tells of the changes that have occurred. Well, this year there are two diseases that are primary in their interest, though not by any means the most important of the diseases that afflict mankind as well as animals. Unquestionably tuberculosis continues to be the most serious of all of the diseases that afflict animals as well as man, unless we refer to the respiratory disorders which unquestionably must afflict the animals. But there is one thing about a cow—she cannot read, she cannot tell what time it is, and she cannot tell you when she has a slight cold. A human being with a slight cold is likely to put a buckeye in his pocket and go to bed. A cow merely keeps on doing what the usual business of the cow has been.

The conditions that are of greatest interest today are tularemia, of course, and undulant fever. As I have looked over the literature concerning tularemia, I considered it the most romantic of all of the special studies that have been made in bacteriology and immunology in recent years. We know how the thing began with the first studies by McCoy, on the Pacific Coast, and how Edward Francis then came into the picture and began localizing the disease as it occurred in man in various portions of our own country and how he finally went into the laboratories of the United States Public Health Service. Because of his research
and especial attention given to the disease, it is known in this country as tularemia Francis, or Francis disease.

At the very same time, Ohara in Japan was studying the disease as it occurred there among rabbits. As it greatly afflicted mankind, Ohara, being a Japanese scientist and apparently without sentiment as most scientists are, picked his wife as the first experimental victim. He inoculated her with tularemia and watched the course of the disease very carefully. I think one of the most conspicuous examples of scientific writing that I have ever read is Ohara's description of tularemia as it occurred in his wife. You would think he was writing about a rabbit. He describes the condition carefully and says constantly, "The patient was doing this," or "The patient was doing that." It is a marvelous example of objective writing in science.

In the meantime tularemia has begun to appear all over the world. This disease of which so little was heard is now seen everywhere. In Russia, because of the conditions of famine which exist and the bad organization that is in Russia today, in its government, the natives are commencing to spear their food and going back to primitive ways of getting food to eat. Recently a great epidemic of tularemia occurred because a certain group in Southern Russia were spearing muskrats. In jerking out the speâr, the hands became soiled with the blood of the muskrats, and there was a tremendous epidemic of tularemia in that portion of Russia. So this disease, of which practically nothing was known or nothing was heard ten years ago, is today one of the most conspicuous features of disease throughout the world.

Another extremely interesting relationship is, of course, the direct connection that has been traced between undulant fever and contagious abortion. The immunology associated with that is highly complicated. Very few people have any real conception of the work of Alice Evans, but I believe it has been quite definitely established that there is a relationship between the bacterial organisms involved. If immunological studies mean anything, those immunological studies have been fully established as scientific.

It is possible in our modern affairs of life to exalt any disease far above its actual importance. The newspapers do this sort of thing constantly when they collect a certain type of disease or accident or injury as it occurs all over the country, in a single column. They did that about a year ago when they began collecting cases of juvenile suicides as they occurred throughout the
country, in a single column. As you picked up your paper you
found in a certain column that two boys had committed suicide,
one at Swarthmore and one at the University of California. The
next day you found that three boys had committed suicide, one
in Alabama, one in Chicago and one in the western part of the
United States. If they had kept that record day after day and
kept it up throughout the year, at the end of the year it would
have been found that there were just as many suicides that year
as every other year. There had been no great epidemic of
juvenile suicide, but the mere collection of cases in a single place
had focused attention very strongly upon that particular problem.

There is the propaganda carried on in connection with accidents
from motor cars. That number is fairly constant in our country.
It does not increase or decrease greatly and probably will not
increase or decrease greatly, because the human being is naturally
a careless animal, and there are more and more motor cars.
The collection of the accidents each day in the news columns
focuses attention on the accidents.

When a new disease strikes the public interest or scientific
interest, as far as it relates to scientific periodicals—and undulant
fever has—it is quite possible to focus an undue amount of atten-
tion on that disease and begin to forget the other diseases which
are far more menacing than this new condition which is inter-
esting because it is new. That is, I believe, an important point
to realize in relationship to undulant fever and to tularemia.

The important disease, the disease which we must constantly
watch, the disease which arouses the greatest amount of interest
from the point of view of capital and damage and finance and all
of the other relationships of medicine and veterinary science, to
life in general, is tuberculosis. The campaign against tuberculosis
is a never-ending campaign. The wiping out of tuberculosis from
herds of cattle is a thing which causes consternation wherever
the message is carried. Gradually the campaign is winning its
way. But wherever medicine and veterinary science strike into
capital and finance, you have one of the most tremendous battles
that you are likely to have. This thing does not strike them so
far as it relates to a few cases of contagious abortion, or a few
cases of undulant fever, but when it comes to wiping out half a
herd of cattle, you are bound to have a great public repercussion.
They begin to ask questions; they begin to say, "We must not
lose sight of these constant and dangerous and extensive diseases
which are constantly afflicting both animal and man."
There is one other point which I think you must all bear in
mind, and I constantly tell physicians that they must bear it
New questions come upon the surface for medical and for sci-
cific attention generally. There is no man in the field of sci-
cific medicine or in the field of veterinary medicine who cannot
have on any day the opportunity to make a name for himself by
having applied the very highest type of scientific observation to
the problems that he sees. Some of the greatest discoveries made
in medical science have been made by general practitioners work-
ing out in the field, merely because they had their eyes open and
were awake to a new situation or a new problem when it suddenly
appeared before them. Other men were perhaps seeing the same
thing here and there, but they did not have that type of critical,
scientific eye which is able to see the new problem when it
appears. So I say that all of us must remember that in the midst
of the great routine which we must carry on as a means of liveli-
hood, there exists constantly the opportunity some day to come
to the surface with a new observation, a new discovery, to bring
this to the attention of our colleagues in the proper scientific
organization, and, when it is established, to receive the merit
that comes to every scientific man who does something actual
for the good of his science and for mankind generally.

Thank you. (Applause)

President Lamb: Next is the President's address.

President Lamb read his address. (Applause)

THE ADDRESS OF THE PRESIDENT

By C. G. Lamb, Denver, Colo.

State Veterinarian of Colorado

Members of the Association and Guests:

This session marks the thirty-third annual meeting of this
association. As we look back over the intervening years since
its inception and consider its growth, from a very small, poorly
attended and poorly supported association to the present splen-
did organization, we must be forced to the conclusion that this
growth in size and influence must be due to the fact that the
Association is doing well a work that is of value to the several
states and to the country at large. In our retrospection we point
with pride to the great advances made in the field of control and
prevention of animal disease, credit for which must be given in
most cases to members of this association or to agencies affiliated with this organization. We will briefly refer to a few of the outstanding activities which have received the attention of the Association.

**Foot-and-Mouth Disease**

Several outbreaks of foot-and-mouth disease, some of which involved rather extensive areas, have been successfully combated and the disease eradicated, and should another outbreak occur, which Heaven forbid, both the federal and state agencies are much better prepared to cope with it than ever before. This fact was very well illustrated during the recent outbreak in California. It will be recalled that during the outbreak in that state in 1924, the entire country seemed to be in a state of panic. I took occasion last spring to wire the sanitary authorities of all western states asking if they thought it necessary to hold a meeting to consider the issuance of quarantine measures and almost without exception the replies were in the negative and expressed confidence in the ability of the federal and state authorities to cope with the situation successfully.

While opposition has been encountered in some cases by injunctions, court proceedings, and so forth, the slaughter method of combating this disease is so well known as being the method that has been and will be adopted in any outbreak of the disease, that the public is prepared for it and expect it and its very important supplement, *official* cleaning and disinfection of infected premises; without the latter the former would be ineffective.

This method of slaughter of all infected and exposed animals is applicable to this disease, because only comparatively small areas of the country have ever become involved, but in the case of more widely spread diseases this method cannot be adopted, but other means for their suppression or control have to be found.

**Tuberculosis**

During the twelve years since the campaign against this disease was started, most satisfactory progress has been made. Two entire states and large areas in many other states have been officially declared clean. In addition a very large number of individual herds have been accredited and it would seem that there is very good reason to assume that the disease will, in time, be very largely controlled, and it does not seem presumptuous to look forward to its eventual eradication. In combating this disease we are greatly assisted by the fact that it is undoubtedly
communicated to man and to the fact that a large and rapidly increasing number of health authorities are becoming interested in the problem of its control in animals and insisting that all cows furnishing milk to cities and towns within their jurisdiction must have successfully passed a tuberculin test, thus removing many reactors and herd menaces that might not have been discovered under other conditions. This support and cooperation might not be accorded our efforts if it were purely an economic problem, and we are not likely to get such valuable support and cooperation in the control or eradication of any disease where the result sought is entirely economic.

**Hog Cholera**

A method of vaccination has been perfected by which the swine-raiser is practically assured of freedom from loss from this disease, and while severe losses continue to occur from this disease, it is largely due to the fact that swine-raisers do not avail themselves of the means of prevention available to them.

While cholera is not by any means the only cause of death among swine, the pig that has been properly protected at a proper age against this disease is in a condition to combat other diseases more successfully.

There are numerous other valuable contributions in the field of preventive medicine, including blackleg vaccination, rabies vaccination, anthrax vaccination and many others capable of preventing much loss, but they are only valuable if properly and generally used, and as long as the public are careless, indifferent and negligent in their use, so long will losses occur from these preventable diseases.

**Tick Eradication**

When the tick eradication project was first suggested, I, personally, was very skeptical as to its practicability. I thought it was like trying to sweep back the tide with a broom, but the results accomplished have been wonderful, and my hat is off to those men whose untiring efforts and persistency have made these results possible. While much remains to be done, the success achieved in certain localities and the very evident benefit to owners of live stock in those localities cannot fail to be an object lesson to others in localities where the work is, as yet, unfinished, and act as an incentive to stock-owners in such localities to secure for themselves like advantages and cause them to encour-
age the prosecution of the work and uphold the hands of those engaged in the work of eradication.

While we "point with pride" to the accomplishments and progress made in the past, we do not "view with alarm" the tasks confronting us in the future. While we realize the enormity of the tasks before us, our experiences in the past forewarn us of the difficulties and disappointments before us, as we enter into a warfare upon several diseases and conditions which urgently demand our attention, but encouraged by the successful inauguration of measures for the control of other diseases to which we have given attention, we should approach these other tasks with a grim determination to buckle down to them with vigor and slowly and gradually bring order out of chaos, not deterred from this attitude by any disappointments or discouragement, but press on persistently until the goal be finally attained.

I shall refer briefly to only two or three diseases and conditions which seem especially to confront us.

**Contagious Abortion**

This disease probably causes more loss to the cattle-grower than any other single disease affecting live stock, and its control seems to be one of the major problems confronting us. This disease, its etiology, methods of dissemination and measures for its control have received much attention at the hands of this association and its members, and the results of these investigations have been encouraging, and our knowledge of it is constantly increasing, but it presents so many conflicting and confusing angles that very much yet remains to be done before we shall be able to offer to the public a standard and practical method of controlling it. Here is a disease in which disinfection plays a very important part, and disinfection as it is understood and practiced by the layman and farmer is not likely to be productive of proper results. It is probable that this disease will receive more attention from the public and public health authorities in the future on account of its possible connection with undulant fever of the human family.

**Poultry Diseases**

Diseases of poultry have more recently received increased attention at the hands of the sanitarian. The poultry industry has increased by leaps and bounds and with this increase and by the great increase of the shipment of poultry, especially baby chicks, the incidence of disease, more particularly bacillary white
diarrhea, has increased and become so wide spread that it threatens the entire industry, which has become one of the major industries of the entire country, and its control, together with the control and suppression of other poultry diseases, becomes one of our great problems.

These problems are receiving the attention of our scientists and of the poultry-raisers themselves, and I am confident that in due time some satisfactory method for the control of these poultry diseases will be worked out.

Parasitic Diseases

Parasites, both internal and external, take an enormous toll both of life and condition from many of our domestic animals. Much attention has been and is being directed toward their control but much yet remains to be done; but not much can be done without the intelligent and whole-hearted cooperation of the owner, who should be the most interested party. Here, again, disinfection is a most valuable adjunct to any method of control and here again disinfection as practiced by the owner is not likely to be productive of results.

While I do not by any means consider this my "swan song," as I hope to continue in this work for a considerable length of time and to attend many future meetings of this association, I am constrained to inject some thoughts that may be considered pessimistic and may seem to strike a discordant note, but I assure you they are not so intended.

I want to sound a word of warning against an over-optimistic attitude and too enthusiastic declarations or promises regarding the eradication of any animal disease. The eradication or even control of any disease is dependent upon so many circumstances and conditions, many of which seem beyond our control, that even to prophecy that any certain disease may be eradicated seems almost folly. I concede that foot-and-mouth disease has been eradicated and that probably the last organism causing it has been destroyed, but it must be remembered that the disease existed in only a very limited area in the country, that very vigorous methods were adopted—the slaughter of all infected and exposed animals—and the official cleaning and disinfection of all infected premises. Does any one suppose if such cleaning and disinfection had been done by owners, with their conception of what a thorough job of this kind is, that there would not have been a reinfection? The public has been educated as to what will
occur in the event of an outbreak of this disease and, in most cases, are prepared for it, but these drastic methods are not practical to other and more widespread diseases.

If the term "eradication" of a disease is meant to imply the destruction of the last parasite or organism causing such disease, then I beg that you do not get disheartened or discouraged at failures to accomplish it, for we must realize that this is a campaign not to be concluded in one generation; in fact I look upon eradication as a dream of Utopia, exceedingly difficult of attainment, and to be attained, if at all, only after many years of hard work and in educating the public as to the desirability and necessity of such eradication, and we all know the difficulty of educating the public to be absolutely of one mind on any subject.

Our experience with sheep and cattle scab, in which diseases we are dealing with a visible parasite, whose habitats, habits and life history are well known, seems to demonstrate that, in spite of the fact that progress is being made, the destruction of the last parasite causing these diseases is in the far-distant future. The cause of these diseases is well known to all and the certain remedy equally well known, and still interested stockmen do not avail themselves of it and the diseases continue to prevail. If this is the case in diseases occasioned by a parasite, what shall be said of the prospects for the eradication of a disease such as hog cholera, where we are dealing with an ultramiscopical organism?

The swine-grower has a means of protecting his herd, at least to a very large degree, against this disease, but in too many instances does not do it and losses frequently occur, and when they do, sanitation and disinfection, if any, are of the crudest character and entirely inadequate to produce results.

What shall we say of anthrax, an earth-born disease? In localities where this disease exists the infected ranges are generally well known and animals using such ranges may be protected against the disease, but often times they are not, the owners preferring to take a chance of loss rather than go to the expense and trouble of vaccinating. Deaths occur, carcasses are not properly destroyed and additional areas become infected to become a menace for many years. If the interested stockmen do not take advantage of their opportunities to protect their animals from disease, how can we expect them to become enthusiastic about eradication? We must also bear in mind that in the eradication of disease which has for its goal the destruction of the
last parasite or organism, the elimination of the last small percentage of infection is the most difficult. It is comparatively easy to inaugurate a campaign of control or eradication when a disease is rampant and a large number of animals are affected, but as the disease is brought under subjection, the interest and enthusiasm of the public wanes about in proportion to the subsidence of the disease, and the completion of the work calls for a large amount of patience, persistency and stick-to-itiveness.

I have presented these apparently pessimistic suggestions simply that we might again remind ourselves of the great undertakings and projects still to be mastered and so that we might be better prepared to meet and withstand the disappointments and discouragements we are bound to encounter. We are, in a way, pioneers in this work. We are building upon a foundation handed down to us by our predecessors, and it is our province to strengthen and improve that foundation as our experience and increasing knowledge indicate, so that our successors may carry on uninterruptedly the work which we consider so well begun.

We should continue unremittingly our studies and investigations of the cause of disease and of the remedy, and fully inform the public of the results obtained so that they may be advised of the fact that in all our efforts we are earnestly striving to obtain results that will be to their material benefit and not for our own aggrandizement, so that when legislation is needed the demand for it may come from them, in which case the legislative enactment may contain many more “mays” than “musts.”

We may meet in solemn conclave, discuss these matters and outline plans and methods for the control or eradication of certain diseases, but we must not lose sight of the fact that we are absolutely dependent upon the individual veterinarian in the field, by whom, in the final analysis, the greater portion of the actual work must be done. We are dependent upon his ability, his integrity and his active and whole-hearted cooperation and without this assistance from the veterinarian in the field we can accomplish but little.

My plea to the educators of future veterinarians, upon whom will devolve the task of carrying on this work in the future, is that they impress upon their students the fact that the success of all these projects depends upon each of them individually and that the reputation of the entire veterinary profession is in their keeping for good or ill, not alone in their ability, which is of
secondary importance, as compared with their reputation for honesty and integrity.

President Lamb: We will now have the report of the Secretary-Treasurer, Dr. O. E. Dyson.

... Dr. Dyson presented his report...

FINANCIAL STATEMENT

RECEIPTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
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<tr>
<td>Membership dues</td>
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<tr>
<td>State memberships</td>
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<tr>
<td>Reports sold</td>
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<tr>
<td>Interest on U. S. Bonds and Treasury Certificates</td>
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<td><strong>TOTAL RECEIPTS</strong></td>
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<td><strong>484.90</strong></td>
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DISBURSEMENTS

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<th>Amount</th>
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<td>Stenographic report</td>
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<td>Postage</td>
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<td>Nutritional Committee expense</td>
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<td>Tuberculosis Committee expense</td>
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<td>Tick Eradication Committee expense</td>
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<td>Swine Committee expense</td>
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</tr>
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<td>Printing and stationary</td>
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<td>Clerical hire</td>
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<td>Express</td>
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<td>Telegrams</td>
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<tr>
<td>Programs</td>
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<td><strong>TOTAL COST OF MEETING</strong></td>
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<tr>
<td>Investment—U. S. Bonds</td>
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<tr>
<td>Cash Balance, December 1, 1929</td>
<td>$208.91</td>
</tr>
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$2,235.28

CURRENT ASSETS—U. S. Treasury Certificates $2,000.00

U. S. Liberty Bonds $1,500.00

Cash Balance in Bank $208.91

$3,708.91

LIABILITIES—None.

STATE MEMBERSHIPS*

Alabama
California
Colorado
Connecticut
Florida
Georgia
Illinois
Indiana

Iowa
Kansas
Kentucky
Maryland
Minnesota
Massachusetts
Mississippi
Montana

Nebraska
New Hampshire
New Jersey
New York
North Carolina
Nevada
North Dakota
Ohio

Oklahoma
Pennsylvania
Texas
Utah
Vermont
Virginia
Wisconsin
Total—51

U. S. Bureau of Animal Industry
Canadian Department of Agriculture

*New members (1930)—Idaho, Michigan and South Carolina.

President Lamb: Gentlemen, you have heard the report of the Secretary-Treasurer, showing that we are capitalists. We have over $3,700. If we can continue Dr. Dyson, or an equally good financier in this position, we may become very largely interested in government bonds.

What will you do with this report?

Upon motion regularly made, seconded and carried, the report of Secretary-Treasurer Dyson was adopted.

President Lamb: We will stand adjourned until two o'clock.

The meeting adjourned at 11:10 a.m.

ADJOURNMENT
BUYING REPLACEMENT COWS FREE FROM 
BRUCELLA ABORTUS INFECTION

By John G. Hardenbergh, Plainsboro, N. J.

Director of Laboratories,
The Walker-Gordon Laboratory Company, Inc.

At the time this is written, the live stock sanitary authorities of at least fifteen states have promulgated specific regulations designed to prevent or to control the importation into their respective commonwealths of cattle reacting to tests for Brucella abortus infection. Many of these dicta are of recent origin.

The establishment of dairy herds free of Bang's abortion disease is proceeding with considerable rapidity and in some states the requests for official supervision of this work are taxing the resources of the control officials.

In a few instances, state departments and local boards of health have taken quite drastic action to guard the public against an alleged serious danger from Br. abortus-infected milk.

The two national associations representing the medical milk commissions and the producers of certified milk have prescribed action for the elimination of infected cattle from the herds operating under their standards that are not already free from Bang disease.

And so it goes. The demand for blood-tested cattle is increasing by leaps and bounds, whereas a few years ago it was limited almost entirely to the sale and purchase of pure-bred cattle. The resulting picture reminds one of the proverbial snow-ball on a down-hill rampage and the big question for most of us seems to be either how to keep ahead or how to get out of the way.

Certainly, the demands of the situation are going to place a big burden upon the dairy industry and tax the ingenuity of live stock sanitary officials. It will require the earnest cooperation of both to anticipate the right moves and it is to be hoped
that they will be aided by prudent legislation and not hampered by radical demands.

The establishment of dairy herds free from *Br. abortus* infection offers many angles of study. For instance, the building-up of many of these herds, for the present at least, must be done mainly by the purchase of mature cows. Recognizing that such a system may have some objectionable features and a few undesirable results, it is well to learn, if possible, what may be anticipated in the way of satisfactory and permanent benefits. With this in mind, it may not be amiss to recite some of the experiences and observations incident to a program for the elimination of Bang's abortion disease in three large dairy herds producing certified milk. In these herds no intensive work was undertaken prior to 1928, although abortion disease had been a matter of research study for several years. No apology is offered for what may be considered a late start, for, if you will recall the differences that have existed in scientific and official circles, no crystallization of opinion as to remedial measures took place until a few years ago. Even now we are aware that certain differences exist and that much remains to be learned.

At the time control work was undertaken in the herds referred to, they comprised some 1400, 400 and 375 mature cows, respectively. In this report, only the largest of the three herds will be considered, it being the one which has been under most immediate observation and from which the most exact data are available. With respect to the replacement of positive cows in this herd, existing conditions did not permit the complete adoption of the best methods, *i.e.*, the exclusive use of home-grown heifers reared free from *Br. abortus* infection or the purchase of negative open cows. Although a certain number of heifers were available, yet it was recognized that for a few years the bulk of replacements would have to be mature cows until such time as heifer raising could be expanded to meet requirements. Furthermore, practically all of these cows would be purchased in advanced stages of gestation, as is the practice in many commercial dairy herds.

Table I presents data which help to visualize some features of the problem. Beginning in 1926, the herd had undergone considerable expansion so that, when testing was begun in January, 1928, the herd had doubled in size in four years. With respect to cows sold, it should be stated that these animals are sold to slaughter and not into other dairy herds. The number of such animals may appear excessive until the fact is considered that
cows are sold out of certified milk herds for a number of reasons that are not common to other herds, such reasons being slack quarters, blind quarters, chronic "high-counters," mastitis repeaters, and so on.

The number of herd replacements and additions shows a proportionate increase and would be still more striking if heifers added to the herd had been included, but these have been purposely omitted.

With respect to these purchased cows, their status as to blood-serum reaction to Br. abortus was not definitely known until 1928. However, a few tests conducted in 1927, prior to the inauguration of control work, indicated that a considerable percentage were reactors. These figures are given in table II, along with tests on a number of animals which were not tested prior to purchase in 1928. It will be noted that the percentage

<table>
<thead>
<tr>
<th>Year</th>
<th>Cows in Herd*</th>
<th>Cows in Production*</th>
<th>Cows Sold†</th>
<th>Herd Replacements and Additions Purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1923</td>
<td>873</td>
<td>706</td>
<td>273</td>
<td>182</td>
</tr>
<tr>
<td>1924</td>
<td>806</td>
<td>630</td>
<td>260</td>
<td>167</td>
</tr>
<tr>
<td>1925</td>
<td>884</td>
<td>737</td>
<td>284</td>
<td>319</td>
</tr>
<tr>
<td>1926</td>
<td>1110</td>
<td>902</td>
<td>314</td>
<td>587</td>
</tr>
<tr>
<td>1927</td>
<td>1380</td>
<td>1138</td>
<td>503</td>
<td>633</td>
</tr>
<tr>
<td>1928</td>
<td>1660</td>
<td>1309</td>
<td>557</td>
<td>638</td>
</tr>
<tr>
<td>1929†</td>
<td>1750</td>
<td>1331</td>
<td>874</td>
<td>762</td>
</tr>
</tbody>
</table>

*Figures given represent the mean between highest and lowest for the year.  †Includes both negative and positive cows. ‡To November 10, 1929.

of positives ranged from zero to 52.1. The animals included in table II came from six different states and the dominion of Canada, and it is believed that the results may be taken as a fair cross-section of what may be encountered in previously untested cattle. The average incidence of reactors (25.6 per cent) is somewhat below the average we have encountered in testing several dairy herds but is sufficient evidence of the importance of applying the agglutination test to prospective purchases.

**Blood Tests on Purchased Cattle—1928**

After separation of the herd into negative and positive groups in the spring of 1928, replacement cows with a few exceptions were purchased subject to the agglutination test for Br. abortus infection, beginning in June, 1928. This work was undertaken
with recognition of the facts that one hundred per cent results could not be expected, that one test on cows from previously untested herds is meagre guarantee of permanent safety, and that a few cows purchased as negative would be positive after calving.

In the beginning it was decided to accept tests performed only by official state or university laboratories, this because it was felt that at that time, few practitioners had had opportunity to become sufficiently experienced with either the regular or Huddleson rapid method of agglutination technic. We wish to make grateful acknowledgment of the services rendered by all the laboratories who performed this work for us during the first year.

**Table II—Reactors to the agglutination test encountered in cows not purchased subject to test**

<table>
<thead>
<tr>
<th>Date</th>
<th>Load</th>
<th>Cows</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>2-27-27</td>
<td>A</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>4-11-27</td>
<td>B</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>4-18-27</td>
<td>C</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>7-8-27</td>
<td>D</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>8-22-27</td>
<td>E</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>8-22-27</td>
<td>F</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>9-25-27</td>
<td>G</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>9-30-27</td>
<td>H</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>8-9-28</td>
<td>6</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>9-3-28</td>
<td>9</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>9-3-28</td>
<td>10-14</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>9-11-28</td>
<td>15</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>9-13-28</td>
<td>17</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>9-20-28</td>
<td>19</td>
<td>27</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>308</td>
<td>79</td>
</tr>
</tbody>
</table>

In the field, it was found that the project of buying dairy cattle subject to test direct from the farmer involved something of an educational campaign. It may be surprising, but even as late as the summer of 1928, the stock-owners of some of our foremost cattle-exporting states were not very cognizant of the work being done to control abortion disease. Oftentimes it has taken the best persuasive efforts of the buyer and local veterinarian or dealer to obtain permission for the collection of blood samples. This was particularly true at a time when few buyers were requiring the blood-test and the cow-owner felt that he was being put to an unnecessary amount of trouble since, in all probability,
another buyer would be along the next day or the next week who would buy his salable cows with few questions asked. However, this situation is largely changed today, at least in the districts where most of our cattle are bought.

In following up the results of this plan the practice was followed of retesting each load of cows immediately upon receipt.

### Table III—Results of agglutination retests (made immediately after receipt) of cows purchased subject to test

<table>
<thead>
<tr>
<th>Date</th>
<th>Load</th>
<th>Cows</th>
<th>Positive No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-2-28</td>
<td>1</td>
<td>28</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>6-28-28</td>
<td>2</td>
<td>34</td>
<td>3</td>
<td>8.8</td>
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<tr>
<td>7-15-28</td>
<td>3</td>
<td>32</td>
<td>4</td>
<td>12.5</td>
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<td>32</td>
<td>1</td>
<td>3.1</td>
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<td>35</td>
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<td>27</td>
<td>3</td>
<td>11.1</td>
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<td>2</td>
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<td>0.0</td>
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<tr>
<td>8-16-29</td>
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<td>37</td>
<td>62</td>
<td>2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

| Totals | 862 | 55  | 6.3 |

S.S. = Slightly Suspicious.  
H.S. = Highly Suspicious.  
Pos. = Positive.

This was done not with the sole idea of detecting discrepancies between tests made by laboratories in the states of origin and our own laboratory, for it was realized that certain differences in interpretation were sure to arise. The principal purpose was to have a complete agglutination test record on each cow beginning at time of arrival on the premises. Also, since each cow was to
be retested after calving, it was desirable to have a previous test made by the same laboratory for comparative purposes.

Table III shows the results of these retests on twenty-seven loads of dairy cows purchased from June, 1928, to August, 1929. It will be noted that the percentage of positives ranges from zero to 20 and that 55 reactors were found out of a total of 862 (6.3 per cent). This represents a net gain over untested cattle of nearly 20 per cent fewer reactors.

At first glance, the results depicted in table III may seem like a poor showing. However, the figures given are an unaltered record of exactly what happened and a revision might be made to eliminate certain errors that are not chargeable to the tests. For instance, in load 22, we know that two or three cows either were never tested prior to purchase or that mistakes were made in reading ear-tag numbers, or that samples were wrongly labeled when submitted for test in the state of origin. Similar errors may have occurred in loads 24 and 25. Due to difficulties in checking such errors, results have been given as found.

In a few instances, the fact that reactors were found on retest is due largely to differences in technic or differences in interpretation of reactions in the different laboratories. When these differences are eliminated, the efficiency of buying cows subject to test is increased considerably, as might be expected. This will be discussed later.

**Blood Tests on Purchased Cattle—1929**

In the summer of 1929, it became necessary to revise the system of testing cows prior to purchase. This was partly due to the fact that in one state where a considerable number of replacements are obtained, the control of Bang's abortion disease was placed in the hands of the practising veterinarians under the supervision of the state live stock sanitary officials. This control work included the actual agglutination testing of herds by the veterinarians themselves.

Feeling that there might be considerable lack of uniformity in results during the initial stages of development of this work, it was decided to run check tests with one or two veterinarians in the field. Accordingly, beginning in June, 1929, one of two plans was followed: either duplicate samples were taken, one being tested by the local veterinarian and one being sent to our laboratory; or, the local veterinarian first tested the samples and then sent the negative ones only to us for check. Results were
then compared, but the entire responsibility for detection of reactors was our own.

At first, as might be expected, some very discordant results were reported from the field, most of these being due to marked differences in technic or to lack of experience with the agglutination test. However, by exchange of test data and close attention to uniform amounts of serum used by the field veterinarian and the home laboratory, these variations have been largely eliminated.

A word about the tests used in the field and in the laboratory. The few local veterinarians with whom we have worked have used the rapid test devised by Huddleson or a modification of it. After nearly two years of experience with this test as a check against the slow method, I wish to go on record as entirely satisfied with its accuracy. When carried out according to the technic recommended by its originator and with a properly prepared antigen, it gives results that are just as dependable as the slow method, in our experience. Any difficulties encountered with this test can, I believe, be attributed to failure to employ proper amounts of serum, or to improperly prepared or unstandardized antigens or simple lack of experience with such work.

In our own laboratory, we have employed the slow test as a standard, using dilutions of 1:25, 1:50, 1:100 and 1:200, a polyvalent antigen corresponding to the No. 1 tube of the MacFarland nephelometer and an incubation period of 48 hours at 37°C. From the first we have used a modification of the Huddleson test as a check, using only one amount of serum (0.04 cc) and 0.03 cc of antigen. By reading this curtailed test on a four-plus basis, we have obtained a correlation of results with the slow method that has been extremely helpful and reassuring.

To return to the subject: Since June, 1929, we have purchased cows either on a system of check testing with the local veterinarian or by having the samples sent direct to our own laboratory. On this basis, to refer again to table III, we have purchased (beginning with load 26) and retested 377 cows, with six reactors (or 1.6 per cent) being detected when the animals were received. This figure is not cited to make invidious comparison with the work of others but to show the greater uniformity of results obtainable when tests and retests are done by the same laboratory.

RETESTS OF PURCHASED COWS AFTER CALVING

As stated earlier, practically all cows purchased under this system are in advanced stages of gestation and calve as a rule
within one week to two months after receipt. It has been our practice to retest these replacement cows not sooner than twenty days after calving; the same is done with all herd cows.

Table IV shows the results of these retests. Of 716 replacements negative to the blood test that had freshened at the time of compiling the data, 30 (4.2 per cent) gave positive reactions; of 746 cows in the herd one year or more that calved during the same period, 19 (2.5 per cent) gave positive reactions. It cannot be said that all of these reactions in replacement cows is due to infection prior to purchase, since we have no precise method of eliminating possible exposure to infection during the pre-calving period. Our only criterion is that these cows after receipt were in contact solely with clean cattle, as indicated by the agglutination test, and that they were handled and managed under good hygienic and sanitary conditions.

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<th>LOAD</th>
<th>REPLACEMENT COWS CALVED*</th>
<th>POSITIVE</th>
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<th>POSITIVE</th>
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<td></td>
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<td>%</td>
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<td>%</td>
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<td>37</td>
<td>32</td>
<td>1</td>
<td>3.1</td>
<td>34</td>
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</tbody>
</table>

| Totals   | 716  | 30  | 4.2 | 746  | 19  | 2.5 |

*To November 16, 1929.
Discussion and Summary

It is apparent that the title of this paper is not strictly correct; the report indicates attempts to purchase cows free from Br. abortus infection without having achieved unqualified success. However, it is not the intent to stress the difficulties and errors encountered but rather to show results that may be accomplished. The data presented constitute an unpolished investigation in which many variable factors have not been eliminated. In the experience of others, these figures may indicate poor results; on the other hand, they may be a fair sample of the results that may be anticipated under average conditions. With the experience gained thus far, we hope to make better progress in future work of this kind.

As an indication of what may be accomplished under conditions that are not ideal, a few more facts may be of interest. In the herd under discussion and starting from scratch, as it were, in 1928, with nearly 1700 cows, 35 per cent of which reacted on the initial test, reactors have been eliminated and replaced largely with purchased cows at a steadily increasing rate, so that today the herd is nearly clean. In the second herd of some 375 cows and beginning in August, 1928, with a similar proportion of reactors, sufficient progress was made so that only a few reactors are being retained until after calving. In the third herd of some 400 cows and beginning in January, 1929, with 34 per cent reactors, it was possible to eliminate all positive-blood cows by October 1 of the same year.

That the sacrifice of cows has been merciless and that the immediate economic loss has been tremendous, must be apparent. However, we can report that cows in the negative group have consistently produced an average one quart per day more than cows in the positive group. This is only one of the many advantages that are steadily accruing to the clean herds.

As a result of the work to date we are convinced of the importance and practicality of buying replacement cows subject to the agglutination test and of the rapid progress that may be made in establishing clean herds. Perhaps the most serious drawback is the fact that demands for control work in some localities have proceeded too fast to permit an economic solution of the problem to be developed.
BUYING COWS FREE FROM ABORTUS INFECTION

DISCUSSION

Dr. C. P. Fitch: There was one point in this paper that I did not get. It might have been clear to everyone else. But in this 19 per cent of reactors on the retest, how long after the first test was this retest made, and were these animals held in quarantine and subjected to a retest 60 to 90 days or 120 days after the original test upon which they were imported?

Dr. Hardenbergh: The retests after calving were conducted not less than 20 days after calving. These cows are purchased in various stages of gestation. Some of them may be close springers and will freshen within a week after they arrive, in which case a period of not more than a month would elapse between the first test and the retest after calving. In other instances there might be a period of two or two and one-half months between the first test and the retest after calving. But during that period these cows were grouped in dry-stock pastures, and the only criterion as to the exposure they might have received was the fact that they were all grouped according to the blood test; that is, only negative cows were allowed in these dry-stock barns or dry-stock pastures.

Dr. Fitch: When you say they were negative, does that mean on the original test?

Dr. Hardenbergh: That means those that were negative after we received them. We have not included in the table on retests after calving any of the cows that we considered positive on receipt. They were truly negative cows before calving.

Dr. Fitch: But not a retested group; that is, there was only a single negative test?

Dr. Hardenbergh: There was a negative test at the time of purchase and a negative test at the time of receipt.

Dr. Fitch: How long an interval?

Dr. Hardenbergh: Anywhere from two weeks to a month and one-half.

Dr. C. H. Kiteselman: Have you had any experience with taking positive cows out of the herd, putting them in isolation, and having them go negative?

Dr. Hardenbergh: We have retested very few positive cows. Once a cow has been positive, we have proceeded to forget about her, largely. We retested 300 or 400 positives and out of that group we did not have any that would be called strongly positive animals that went negative. There were some borderline cases that we might call highly suspicious that did lose enough reaction to go over into the negative group. Some of them went only far enough to be called slightly suspicious; some went clearly negative. We never had a strongly positive cow go negative.

Dr. Kiteselman: Would you put her back if she were negative? I have had some experience with a number of those cows. We did, in one case, put three such cows back in a clean herd. Within six months two had gone positive. The third cow went positive at the expiration of one year. There were breaks in that herd during that year. I think possibly that was the cause of the break.

Dr. Hardenbergh: As far as these borderline cases go and as far as our tests are concerned, they are perhaps just suspicious. Perhaps we draw the line too fine in calling them slightly suspicious and highly suspicious. Those cows go back and forth. First they will be highly suspicious and then maybe slightly suspicious. On the next test they may go slightly suspicious and then strongly positive and stay positive.

Dr. C. H. Case: What do you do with those cows that are slightly suspicious?

Dr. Hardenbergh: Slightly suspicious cows are left with the herd, and highly suspicious cows are eliminated.

President Lamb: We will proceed with the next paper, "The Influence of Nutrition on Contagious Cattle Abortion," by Dr. F. B. Hadley and Dr. M. C. Hawn, University of Wisconsin, Madison, Wisconsin. (Applause)

Dr. Hadley read the paper.
THE INFLUENCE OF NUTRITION ON CONTAGIOUS CATTLE ABORTION

By F. B. Hadley and M. C. Hawn

*University of Wisconsin, Madison, Wisconsin*

For many years the question has been debated as to whether contagious abortion, or Bang's abortion disease, is more likely to occur in cattle on a ration deficient in minerals and low in protein than on a complete ration, i.e., one which meets all the requirements of the animal. The question stated differently is: "Is it possible to lower the resistance of cattle by feeding a ration low in both lime and protein so that they become more susceptible to contagious abortion infection?"

In 1926, the College of Agriculture at the University of Wisconsin, through a fund provided by the Wisconsin Manufacturers Association, assembled a herd of 44 Holstein heifers, ranging in age from six to eight months, for an experimental study designed to answer this question. These animals were purchased subject to the blood test for abortion. It was required not only that the heifers themselves pass the test, but also that every member of the herds of which they were a part should do so. This was to eliminate the possibility of any of them having either an acquired or inherited immunity to the abortion infection.

The heifers were divided equally, according to weight and herd origin, into two lots designated respectively as lot I, or the good-ration lot, and lot II, or the poor-ration lot. Individuals in lot I were identified by odd numbers; those in lot II by even numbers.

Lot I was fed as good a ration as could be provided from the existing knowledge of the principles of animal nutrition. It consisted of alfalfa hay, corn silage, and a good grain mixture containing corn, oats, oil meal, wheat bran, bone meal, and cod-liver oil. The latter was added to furnish vitamin D, which is believed to promote the utilization of both lime and phosphorus. Iodized salt was added to prevent the possibility of goiter. In the summer they had alfalfa and sweet clover pasture. This was a ration that provided plenty of lime and other needed minerals, as well as adequate proteins and the vitamins required to aid in their assimilation.

Lot II was fed what may be termed a relatively poor ration, consisting of corn silage, timothy hay from acid soils, and a grain mixture of corn and oats, fortified with gluten meal. Com-
mon salt was supplied in the usual amounts. In the summer they were pastured on timothy and blue grass. This ration is decidedly deficient in lime for milking cows, only fair in its supply of phosphorus, and somewhat low in its protein content.

During the first year both lots made excellent gains; those on the poor ration gained a little more in body weight. Eventually all were bred and calved at term. Three of the calves died at birth as a result of accidental injuries. None of these first-calf heifers retained her afterbirth and none developed mastitis.

Calves dropped by the heifers on the good ration at birth averaged 90 pounds in weight; those by the poorly fed heifers, 85 pounds. This difference is so small that it has no significance. None of the calves contracted scours; all of them grew rapidly until disposed of for veal or removed from the herd.

After the heifers had been in milk for about three months, they were bred for second calves. About seventy-six days, as an average, after they had been shown to be pregnant, by rectal examination, they were divided into five groups. Each group contained approximately the same number of animals from each lot (see table I). Four of these groups were exposed to the abortion infection; the other was left as a control. The object of the exposure was to determine whether either ration had conferred any protection against, or caused a lowering in resistance to, the abortion infection.

Group 1 comprised six head from the well-fed unit and six head from the poorly-fed unit. On September 21, 1928, these animals were exposed to the infection by being fed a mixture identified as material "A," made from pooling the stomach contents of six aborted fetal calves; on September 25, they were given one feeding of a broth suspension of five laboratory strains of *B. abortus*. Except for contact with cows that had recently aborted and which were introduced to provide additional opportunity of contracting the infection, this experiment group were not otherwise exposed. All of the six well-fed cows in this group aborted. These abortions occurred on the average exactly 90 days after exposure. Four of the six cows in the poorly-fed lot aborted; the other two calved at term. The average length of the period between exposure and abortion or calving for these six animals was 155 days.

Group 2 consisted of four heifers from each lot. They were exposed in exactly the same manner as group 1, with the exception that the exposure material, identified as "B," was taken
<table>
<thead>
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<th>GROUP</th>
<th>EXPOSURE</th>
<th>LOT</th>
<th>COW</th>
<th>DAYS PREGNANT WHEN EXPOSED</th>
<th>DAYS BETWEEN EXPOSURE AND OCCURRENCE OF AGGLUTINATION REACTION</th>
<th>DAYS BETWEEN EXPOSURE AND ABORTION OR CALVING</th>
<th>DAYS PREGNANT WHEN ABORTED OR CALVED</th>
<th>AFTER-BIRTH RETAINED</th>
<th>B. ABORTUS RECOVERED</th>
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</tr>
<tr>
<td>Material</td>
<td>I (good ration)</td>
<td>II (poor ration)</td>
<td>III (good ration)</td>
<td>I (poor ration)</td>
<td>II (poor ration)</td>
<td>III (good ration)</td>
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<tr>
<td>C</td>
<td>5 86 186</td>
<td>4 27 204</td>
<td>11 73 177</td>
<td>18 72 203</td>
<td>26 71 202</td>
<td>25 79 229</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>D</td>
<td>17 77 56</td>
<td>34 70 63</td>
<td>21 81 7 14</td>
<td>30 71 202</td>
<td>30 79 229</td>
<td>25 79 229</td>
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<tr>
<td>Contact only</td>
<td>15 127</td>
<td>26 127</td>
<td>26 127</td>
<td>14 127</td>
<td>36 127</td>
<td>135 127</td>
<td></td>
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Material C: I never reacted, II 271
Material D: I 249, II 275, III 277
Contact only: I 282, II 288, III 288
from the stomachs of seven other aborted fetal calves and the cultures of \textit{B. abortus} were from later seedings. The dates of feeding were September 29 and October 5, respectively. Two of each lot in this group aborted.

Group 3 included three heifers from lot I and two from lot II. The stomachs contents used to expose this group were taken from but one fetus and were designated material "C." The dose was only 25 cc and it was given October 5. These animals were not given a supplemental feeding of cultures. The object in reducing the exposure material was to avoid the possibility of over-exposure and the breaking down of any body defenses that the animals may have succeeded in erecting as a result of the ration. One cow in each lot of this group aborted.

Group 4 consisted of three animals from each lot. They were exposed in exactly the same manner as group 3 with the exception that the exposure material "D" was from a different fetus, and the date of feeding October 25. Two of the three well-fed cows in this group aborted, as compared with none of the three on the poor ration.

Group 5 was for control purposes. Two cows from lot I and four from lot II comprised it. The only chance they had to become infected was through association with the aborting cows introduced for contact exposure and the animals in the other groups, all of which had been exposed, and many of which became infected and aborted. For this reason the date of actual infection could not be determined, so the records for this group are incomplete. Only one cow aborted in this group. This was cow 36 on the poor ration, which dropped a 135-day fetus.

To determine the comparative breeding efficiency of the cows in the two lots, Dr. W. L. Williams' formula was employed. This formula is based on the assumption that 100 per cent equals one calf every twelve months. By this method of computation it was found that the breeding efficiency percentage in the first gestation, for the year ending September 30, 1928, of lot I was 85 as against 80 for lot II. For the year ending September 30, 1929, it was 48 per cent as compared with 67 per cent. In other words lot I showed a higher breeding efficiency before exposure and a lower efficiency afterward.

Heifers 29 (lot I) and 6 (lot II) developed sterility that failed to respond to treatment, so they were considered incurable and sent to the block. For this reason they were unable to complete the experiment and have been eliminated from the data. This
INFLUENCE OF NUTRITION ON ABORTION

seems justifiable, as each was a member of a different lot. It should be stated, in this connection, that of the original 44 heifers, two were transferred to another experiment and three died from traumatic pericarditis.

The average length of the period between exposure and abortion or calving was 128 days for the 16 head in the good-ration lot that are still in the herd, exclusive of the contact exposure or control cases, as compared with 157 days for the 15 head on the poor ration. The average length of the period between conception and abortion or calving was 205 days as compared with 229 days. Eleven (69 per cent) of lot I aborted; while only seven (47 per cent) of lot II aborted. These figures do not include cow 36 in the control group that also aborted, because the animals in the latter group were not comparable. It is of significance that exactly nine (56 per cent) of the well-fed cows retained their afterbirths, as compared with three (18 per cent) of those on the poor ration. The reason for this decided difference has not been found.

The blood of the entire herd was tested at frequent intervals by the rapid agglutination method and check-tested from time to time by the slow or tube method as well as by the complement-fixation method. The reactions were more marked and are persisting longer in the cows on the good ration. The accompanying graph, showing the composite reactions to the blood test of the two lots between September 1 and April 10, brings out the difference in the degrees of reaction. For the purpose of evaluating the reactions a weight of three was given to each complete agglutination reaction (+); two to each partial (P); one to each slight (S); no value to a negative reaction (—). On this basis a blood sample agglutinating in all four amounts, i.e., .02, .01, .005, and .002 cc, would be assigned a value of 12. Incidentally this is a good way to compare results by different methods as well as by different laboratories. Complete agglutination with .02 cc or less was interpreted as a reaction; this was the lowest dilution employed in making the routine tests.

The data show that at any given date the percentage of reactors as well as the degree of reaction was greater in the good-ration lot. This may be accounted for from the fact that several of the cows in this lot had active udder infections. Three of the reacting cows in the good-ration lot calved normally, in contrast to eight in the poor-ration lot. Roughly this is 25 per cent and 50 per cent, respectively. What factors were responsible have not been determined.
The initial average live weight in October, 1926, of the 18 head on the good ration that were still on experiment in October, 1929, was 469 pounds; that of the 19 on the poor ration, 494 pounds. When weighed in October, 1929, these animals averaged 1224 pounds and 1232 pounds, respectively, or had made an average gain per head of 755 pounds as compared with 738 pounds during the three-year period.

The average milk-production of the comparable cows on the good ration from dates of freshening to October 31, 1929, was 15,398 pounds in contrast with 14,355 pounds for those on the poor ration. The average butter-fat production for this period, however, was in favor of the latter, being 476 vs. 500 pounds. This difference is accounted for in the average percentage of fat, which was 3.09 vs. 3.48. It was found that the cod-liver oil, which constituted part of the ration fed lot I, was responsible for depressing the butter-fat more than 20 per cent. So it is concluded that cod-liver oil, no matter how beneficial it may be for other species of farm animals, is absolutely harmful for cows and should never be included in their ration.

Another reason why the poor-ration cows are producing relatively more milk in their second lactation period than those on the good ration is because fewer of them aborted. This fact confirms the observation that abortion reduces milk production.

Examination of the milk of five cows for B. abortus was made after they had been exposed but before they had aborted or calved. These were cows 15, 25, 2, 14 and 26. This study showed the presence of B. abortus in the udder of cow 15 only, although other cows in the herd might also have been found infected if their milk had been examined. Cow 15 had been a reactor for four months, however, before the organism was recovered. Moreover, she has continued to react but calved normally, November 21. This case is of particular significance at present in view of the controversy relative to the importance of B. abortus in milk as the cause of undulant fever in man.

The study of the results of examination of the milk for B. abortus of thirty-three cows after abortion or calving shows that the organism was recovered from only two, viz., cows 13 and 19. The milk of cow 13 yielded the organism on March 1, seven days after she had aborted, but it was negative April 17. The milk of cow 19, which aborted December 30, was cultured March 11 and April 17, and was found to be teeming with B. abortus on both occasions. It is significant that these two cows as well as cow 15,
referred to above, are all in the good-ration lot. Further work along this line is being prosecuted.

Some agglutination tests on the milk-serum have been made to determine whether it is possible to distinguish between reacting cows that are actually shedding abortion bacilli from the udder and those that are not. This phase of the work, however, has not been conducted long enough to furnish sufficient data from which to draw conclusions.

It would seem reasonable on the one hand to assume that those cows which aborted and afterward became negative to the blood test and did not have a demonstrable udder infection, succeeded in eliminating the infectious organism completely. It is just as reasonable to assume that cows 13, 15 and 19, all of which had demonstrable udder infections, were unable to rid themselves of the organisms. Furthermore, in cases which continue to react, yet show no evidence of udder infection, it is believed that one or more foci of infection, located in some organ other than the udder, must exist. The work to date suggests that infection of the udder with \textit{B. abortus} has little or no relation to mastitis.

As was to be expected, the blood of none of the calves that were tested reacted, although the dams of some of them had given clear-cut reactions before they calved.

An attempt was made to isolate \textit{B. abortus} from the bloodstream of many of these cows. The results, however, were negative, as were those of King and Caldwell. We believe one reason for this was that we did not start culturing soon enough after exposure. This work is being continued with the hope that the improved technic now used will furnish information to answer the moot question as to whether the organism does gain entrance to the blood and, if so, how long it resides there.

The highest producing cows on the poor ration undoubtedly were in negative calcium balance during the late winter, if at no other time. With this fact in mind, as well as the new theory that the milk fever syndrome is the result of a hypocalcemia instead of a hypoglycemia, as was previously thought, it is reasonable to expect that some of the cows would be quite likely to develop milk fever. However, to date not one of them has had an attack.

The results of the first three years of this carefully planned and conducted experiment should be considered as a progress report,
CHART 1. Graph showing composite agglutination reactions of cows on experiment.
<table>
<thead>
<tr>
<th>History</th>
<th>Cows on Good Ration</th>
<th>Cows on Poor Ration</th>
<th>Both Lots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Cows that completed 3 years on experiment</td>
<td>18</td>
<td>100</td>
<td>19</td>
</tr>
<tr>
<td>Cows that aborted after exposure</td>
<td>11</td>
<td>61</td>
<td>8</td>
</tr>
<tr>
<td>Cows that calved normally after exposure</td>
<td>7</td>
<td>39</td>
<td>11</td>
</tr>
<tr>
<td>Cows that reacted sometime between October, 1928, and November, 1929,</td>
<td>5</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>but calved normally</td>
<td>2</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Cows that never reacted and calved normally</td>
<td>2</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Cows that had been reactors but at time of abortion were not reactors</td>
<td>7</td>
<td>39</td>
<td>12</td>
</tr>
<tr>
<td>Cows that reacted sometime but 14 months after exposure were not reactors</td>
<td>9</td>
<td>50</td>
<td>3</td>
</tr>
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F. B. HADLEY AND M. C. HAWN

awaiting the outcome of the next two years before drawing final conclusions. However, the following deductions seem justifiable:

(1) Cattle readily becomes infected with contagious abortion, also known as Bang's abortion disease, through taking into the mouth material contaminated with \textit{B. abortus}.

(2) The "good ration" used in this experiment did not increase resistance to contagious abortion infection, nor did the "poor ration" increase susceptibility. In other words, to date there is no indication that feed will control contagious abortion, or that resistance to this disease can be increased by building up the mineral or other nutritional reserves of the cow.

(3) Of the comparable cows on the good ration, eleven (69 per cent) aborted, as compared with seven (47 per cent) on the poor ration.

(4) Cows have the ability to adjust themselves to a much lower lime intake than has been thought possible, \textit{i. e.}, the efficiency of lime utilization increases as the level of lime in the ration decreases.

(5) Cod-liver oil has no place in the ration of dairy cows, as it depresses butter-fat production more than 20 per cent.

(6) The blood test for abortion is an accurate and reliable means of detecting infected animals.

(7) A herd can be established and kept free from the abortion disease if the foundation animals are bought as blood-tested calves from clean herds, segregated, and retested at reasonable intervals.

(8) Approximately 25 per cent of the reactors on the good ration calved normally, as contrasted with 50 per cent of the reactors on the poor ration.

(9) The degree of reaction, as well as the percentage of reactors, was considerably greater in the cows on the good ration.

(10) Some cows that give pronounced blood reactions rapidly become non-reactors; in others the reaction gradually disappears; in still others, especially those that develop udder infections and become "carriers" or "spreaders," the reaction persists for many months.

(11) The presence of agglutinins specific for \textit{B. abortus} in the blood-serum of cows is not sufficient evidence to assume that they are shedding the organism in their milk.

REFERENCE

INFLUENCE OF NUTRITION ON ABORTION 319

DISCUSSION

Dr. L. F. Rettenger: How soon after birth did the calves react negatively and the dams positively to the test? How soon after birth were the calves tested?

Dr. Hadley: They were tested before they had a chance to get any colostrum. I assume the majority of my hearers appreciate that. Most calves do not react, as far as I know, until they have a chance to secure antibodies in the colostrum. You can take aborted fetal calves at any stage of abortion, as far as our experience goes, and draw the blood from the heart and test it, and it does not react. The assumption is that the antibodies responsible for the agglutination reaction do not pass the fetal placenta. Just how reasonable that conclusion is, I will leave for you to decide.

Member: Were any differences noted in the number of services required in the two lots?

Dr. Hadley: That was represented in the breeding efficiency percentages that I gave you. If anything, it was a little in favor of the good-ration lot the first period and in favor of the poor-ration lot the second period. That is an important thing. If lime is a factor in the matter of sterility or "pepping up," we will say, the organs that have to do with reproduction, this experiment ought to show that. By getting the breeding efficiency for the next two years we will be in a better position to answer it.

Dr. H. L. Gilman: Perhaps I missed the point, Dr. Hadley, but what was the percentage of proteins in the poor ration and the good ration?

Dr. Hadley: Professor Hart has full charge of that phase of the problem that we are discussing, concerning the ration and the nutrition. I will ask Professor Hart to answer your question.

Prof. E. B. Hart: The protein content of the poor ration was sufficient, although if we knew what the protein requirements of a milking cow were, we could find it. As a matter of fact, we do not know what the protein requirement of a cow is. It depends on how much she is milking. The amount we give her is below some of the ordinary standards. That is nothing unusual, because the efficiency of your protein mixtures depends upon its source. On a straight alfalfa-grain mixture you can get sufficient protein for a cow milking 65 pounds a day. This mixture that we are using on the poor ration is, according to the standards, somewhat low, but it is not unusually low. The whole experiment was set to tune in under farmers' conditions. Farmers are in the habit of re-enforcing their grains with some protein concentrate. That is what was done in this experiment. In the poor ration we did not try to remove it too far from what a farmer ordinarily does.

The good ration had a very considerable amount of protein above the poor ration but still conformed to the Henry, Morrison or the Haecker standards. There was some spread between the two, but not sufficient, apparently, to have made any difference in this development of resistance to infection.

Dr. C. F. Schlothauer: Was the criterion that you set for a good ration and a poor ration correct? Physically and physiologically, I think the latter is not a poor ration.

Prof. Hart: We chose this poor ration because the roughage used was grown on acid soil, which is a condition that is common in the northern part of the United States. For milking cows it is no doubt too low in its lime content. The phosphorus content, as Dr. Hadley said, is at a rather low level. If you analyze that and compare it with the alfalfa ration, you are sure to have one distinct deficiency with two others on the border line. The one distinct deficiency in dairy cow nutrition in the northern states is the use of these poor roughages with their low lime content. You may not know, but it is a fact that the rations still poorer than this poor one that we have, those made from straws and grains, you can disturb reproduction. The deficiency may be lime or it may be one of the vitamins, particularly vitamin A. It was that set-up that led us to this experiment. But we put the poor ration as one that is not uncommon on farms. You may say that is not a very poor ration. Indications are that these animals have gotten along very well on it. There has not been much difference in the results from the two rations up to date, it is true. Maybe we will have to revise our idea that the ration we call the poor ration was not so poor after all.
I hope none of you get the idea, however, that we should not do good feeding. I hope none of you get the idea that a thing like alfalfa is a superior thing to timothy hay as a source of cheap protein on the farm. Those are the things you must keep in mind.

This experiment has back of it this one question—of whether such rations as you feed commonly in the northern United States, with these poor roughages, would lead to these disturbances, nutrition plus a lowered resistance to infection, as compared with the best feeding you give, and raises the other question, which is a very important one in our own state, the necessity of reinforcing our ration with certain minerals, certain materials of special content like we get from seed and so on, for which claims are made that they will increase their resistance. This is the first time, as far as I know, that we have had facts on the question as to whether the best ration, reinforced with all the factors of nutrition, would have any influence upon the ravages of this infection.

Dr. A. G. Hall: Was the grain ration continued the same right through the experiments?

Prof. Hart: The grain ration has been continued the same with both groups of animals throughout the experiment, corn and oats in one case, corn and oats and oil meal in the other. In the good ration, ten of them had the cod-liver oil taken away at a certain period. The grain mixtures have been the same. Of course, we have to buy in these grains. What variation we have, as we buy them in from various sources, is a thing that we cannot control.

Dr. L. J. Tompkins: I should like to ask what percentage of the positive cows became negative.

Dr. Hadley: The percentage was a good deal less in the other group. Quite a number of those positive cows were distinctly positive, and anybody testing them would undoubtedly pronounce them infected, as they had aborted. They have run down on the agglutination reaction so they do not react even in the lowest dilution which is 1-50 in the set-up we employ.

President Lamb: The next paper is "The Significance of Disease Caused by Bacterium Abortus from the Standpoint of the Agricultural Press," by Mr. E. M. Harmon, Associate Editor of Successful Farming, Des Moines, Iowa. (Applause)

. . . Mr. Harmon read his paper. . . .

THE SIGNIFICANCE OF DISEASE CAUSED BY BACTERIUM ABORTUS FROM THE STANDPOINT OF THE AGRICULTURAL PRESS

By E. M. Harmon, Des Moines, Iowa

Associate Editor, Successful Farming

Knowing as I do the great amount of study that has been given to this problem by many of those present, it is not without some degree of timidity that I approach the subject. It has, however, been my privilege to give fairly careful study to the practical problems presented by the Bang organism for some time. Fourteen years ago, while a student at the University of Missouri, I was helping take blood samples in the University herd for Dr. Connaway. I was privileged to see the work that he did in cleaning up a badly infected herd. Later on, I spent ten years in county agent and college extension work, during which time the evidences of the ravages of the Bang disease were constantly be-
fore me. I am now responsible for the live stock and dairy material in a publication whose subscribers own 42 per cent of all the dairy cattle in the United States, and 71 per cent of all the hogs. For these reasons, I do not hesitate to express the layman's views. In other words, I will talk as a dairyman or stockman who has tried to study this problem in a practical way.

When Dr. Fitch suggested this assignment for me, I told him that I would be glad to express the views of my own organization. However, I remarked that these would not be the unanimous views of the farm press. Many of you who are familiar with the farm publications as a whole know that it would be impossible to do this. Only a hurried study of the editorial contents is necessary to realize that the farm press is not in complete accord on this problem.

**Great Economic Problem**

There are some points, however, on which we must all be agreed. One of these is the fact that the Bang organism presents to the live stock industry of this country one of its greatest economic problems. Investigational work done at the Storrs, Connecticut, Experiment Station showed an annual loss of approximately $44 per cow for every reacting cow in the herd, whether she aborted or not. Studies at the Nebraska station showed losses of approximately $100 per year for every aborting cow. These figures probably check pretty closely, since it is doubtless fair to assume that reacting cows do not abort more than 40 or 50 per cent of the time. Similar results have been found at the Oregon station. All of these above-named studies were carried on by the dairy husbandmen. One of your own members, Dr. Robert Graham, of Illinois, has made similar economic studies which seem to check pretty closely with those already named. In addition to this, there are a large number of individual farms where records showed that the eradication of the Bang disease has very greatly increased profits. Keystone Farms, of Waukesha, Wisconsin, is a notable example of what may be accomplished in this way. They have found an average difference of something like 1,100 pounds of milk per cow in their positive and negative herds. There can be no doubt that the loss in milk-flow is in a large number of cases enough to mean the difference between a profitable and an unprofitable cow. Soon we are to have some more comprehensive data from Pennsylvania, showing how much the disease reduces milk-flow. Another
illustration of the importance of this disease to the dairyman is found in the State College herd at Storrs, Connecticut. Dean George C. White, who is in charge of this herd, reports that until they brought the disease under control, it was a very difficult matter to bring on enough replacements in the herd to take care of their needs and to furnish the milk supply for the local demand. Since the disease has been eliminated, they not only have been able to take care of all necessary replacements, but in the first six months of this year were able to sell more than $8,000 worth of surplus stock. There can be no doubt of the fact that there are countless herds scattered all over this country whose owners could be making a good profit were it not for this disease, but who, on the other hand, are having a hard time making ends meet.

**Loss Approximates $175,000,000**

With our present knowledge, any estimate of the amount of damage caused can be little more than a guess. Estimates as to the number of reactors vary all the way from 10 to 30 per cent or more, with the majority of them over 20 per cent. If 20 per cent of the dairy cows in this country are losing an average of $40 per year on account of Bang disease, that means a net loss of approximately $175,000,000. This takes into account only the losses to dairymen. As far as I know, there are no estimates available as to the losses which accrue to the hog, beef cattle, and poultry industries, as well as in a minor way among other classes of live stock. Probably a quarter of a billion dollars is a low estimate. At any rate, we will all agree that it is entirely too great a tax for the live stock industry to bear.

Another point which we feel is most important from the standpoint of the press and from the standpoint of making the disease itself clear to our readers is the name that has been applied to it. Contagious abortion does not describe it. Abortion is only one of the symptoms of a disease which is causing a lot of trouble and losses in many other ways. Neither is the mere act of aborting proof of the presence of the Bang organism. These facts have caused many men to be led astray. They have shaken the confidence of stockmen and veterinarians, and the press, in some cases, in the blood test and recognized control measures. We feel that this name is most unfortunate. It might better have been termed Bang disease. Had this been done, I think it would have helped us to have arrived at an earlier understanding. If we could reach a place where farmers and veterinarians would
thoroughly realize that the act of abortion is only a symptom of the presence of Bang organism and not definite proof of its presence, then we will have gone a long way toward accomplishing the goal.

Procrastination on the part of stockmen themselves has in the past been responsible for a lot of trouble. This is rapidly being overcome, but even at the present it is possible to find stockmen who try to "kid" themselves into thinking that their herds are not infected. Others realize it, but refuse to admit it. In some cases, men who are in a position to know better have actually encouraged this sort of thing. Not long ago I heard of one stockman who said that an editorial I had written had goaded him to want to blood-test his herd and clean up. A state department of agriculture official, upon learning that he had only had a few abortions in his herd, told him that this was not necessary and that these were probably accidental. We all know that this fellow is probably "riding for a fall" and some serious losses, which could in all likelihood have been prevented. In other words, we have all been too much inclined to dodge the question and plead for more information.

A CHALLENGE TO THE VETERINARIAN

This idea leads right up to the veterinarian. The veterinary profession must get together. Right now, if the average farmer goes to two or three veterinarians and asks for help in cleaning up the disease, he is likely to get as many solutions as the number of veterinarians to whom he talks. Even yet, some supposedly qualified veterinarians are prescribing so-called cures. Of course by doing so, they are only putting off the time when the losses can be eliminated. A great many others are spreading the disease by means of live cultures, employed for vaccination. Others are using dead cultures, the value of which is doubtful at best. Others are working on the definitely approved plan of blood-testing, isolation of reactors, and sanitation. However, as stated above, we cannot expect very much from the farmer or stockman until the veterinary profession does get together. Neither can veterinarians hope to command the respect of the farmer until they do. In this connection I believe it is only fair to give the men who have made a real study of this problem credit for being pretty well agreed on control measures. One of the chief troubles is that in too many cases, these ideas have been slow to permeate down to the practicing veterinarian.
We all agree that there is a lot about this disease which is not known. We are entirely in sympathy with research appropriations to study the various phases of this disease. We even hope that in some way a cure may be found. In the meantime, however, we do know that practical plans are at work which are eliminating the disease. Pennsylvania, with more than 200 accredited herds, is the outstanding example along this line. Missouri has approximately 50 herds which are ready to be accredited, if this plan is decided upon. Illinois and Oregon have great numbers of herds which have been cleaned up. Not long ago the first accredited herd was announced in Wisconsin. The Minnesota and other experiment stations have demonstrated very definitely practical means by which the disease can be eliminated under farm conditions. Connecticut not only has a plan in operation, but has also gone so far as to begin branding the reactors, a point which I advocated editorially two years ago. We have all about us evidences that the disease can be controlled.

The Problem of the Small Herd

In this connection, however, there is one suggestion I wish to take the liberty to make. These plans, for the most part, call for separate barns or at least for a division of the barn for the negative and positive herds. They also call for separate pastures. This is not an easy thing to accomplish on a good many farms. It seems to me that possibly the solution in the case of badly infected small farm herds will rest in bringing on clean crops of calves which can be kept in an isolated pasture or shed and then, at the proper time, eliminating the old infected herd, or at least all of them that are known to be carriers of the disease.

I am firmly convinced that once the disease is thoroughly understood by the farmers, they will go ahead in cleaning it up with a rapidity that will surprise us. The following extract from a letter from one of the leading dairy husbandmen in the United States expresses my own opinions better than I can do it myself:

We must clean up our herds for economic reasons primarily. The facts and methods are known to us and we know that we are able to do this in a practical way. The dairy industry should be permitted to go ahead with its own program and do this very thing. My own opinion is that within 10 years' time the abortion control problem will have caught up with and perhaps gone ahead of the tuberculosis control program throughout the whole United States. My experience in this state leads me to believe that when farmers throughout the country once become thoroughly informed as to the steps to be taken in ridding their herds of this disease, they will go along probably faster than many of the professional people would do if they were handling it themselves.
Sometime ago I mentioned the fact that the farm press is not all agreed. This disagreement varies all the way from out-and-out disbelief in the blood-test to a firm conviction that we do have a definite, practical plan for controlling it. It is my conviction that this offers an important field of endeavor for the live stock sanitary board. The columns of the farm press are not devoted entirely to editorial material, however, and probably the advertising columns are just as important in the matter of disease control. Many publications have barred advertising copy which claims a cure for contagious abortion. Some of those who have barred this type of copy, however, still admit copy which does practically everything but name the disease and lay claim to curative qualities. It is not uncommon to see advertising copy which discusses sterility, lower milk production, low vitality in calves, udder troubles, slinking calves, retained afterbirth, and the other symptoms which go with the disease, and to claim curative properties. It is hard to see how anyone can say that this is any less undesirable than the advertising copy which boldly names the disease and claims for itself a cure. I hesitate to make suggestions in this connection, but as long as there is advertising revenue to be derived from this sort of copy and as long as it is permitted, it will doubtless continue, unless the veterinary profession protests sufficiently.

**Indemnities for Reactors**

Still another question which no doubt bothers the minds of many is that of indemnities for reacting cattle. This disease can hardly be compared to tuberculosis. At least such a comparison should not be made until we have a good deal more evidence on human infection than we have at present. Apparently there is little undulant fever in humans, except among those who actually come in direct contact with reacting animals, or the carcasses of infected animals at the time of slaughter. The danger of infection from drinking milk is so slight as to be negligible and even this is overcome by pasteurization. Neither is it necessary to destroy the infected animal. This puts us on a much different footing than is true in tuberculosis eradication and leaves far less reason for paying indemnities.

Another point which is attracting considerable attention at the present time is the matter of state laws and regulations in dealing with traffic in infected animals. It is quite possible that such regulations are premature. However, it is hard to condemn any
state for any actions taken to date. In every case, regulations which have been made have been prompted by the dumping of infected animals or by its efforts to prevent that dumping. It is quite logical to argue that a state should clean up first before forbidding the importation of infected animals, but it is equally logical to argue that these regulations should be put up first. It is also reasonable to believe that these regulations will have the effect of speeding up control measures.

To summarize, we want to repeat our belief in more research funds. We believe that every phase of this problem should be thoroughly studied. In the meantime, losses are accruing which undoubtedly run into hundreds of millions of dollars annually. We believe thoroughly that practical control measures are known. There is plenty of evidence to support that belief. We believe, too, that the veterinary profession, the live stock sanitary board, college men, county agents, and the press must all get together on clean-up plans, such as are already being carried forward in many states and that when this is accomplished the stockmen themselves will surprise us with the progress they will make.

**DISCUSSION**

**President Lamr:** Gentlemen, Mr. Harmon in his paper seems to have struck many very important nails directly on the head. I am sure that this paper cannot help but bring forth a good discussion from the members. The paper is now open for discussion.

**Mr. E. F. Richardson:** I understood Mr. Harmon to say that abortion was one symptom of this disease. What are the other distinctive symptoms?

**Mr. Harmon:** I believe that a lot of the members of the veterinary profession here are much better qualified to answer that than I am. However, I do know that the matter of sterility, weakened calves, and udder troubles are some of the other symptoms that go with abortion, including retained afterbirths.

**Dr. R. W. Smith:** I hesitate a great deal to enter into a discussion of this subject. I thought a while ago I would save what little I have got to say until after the report of the Committee on Abortion, but many points were brought out in this paper which prompt me to talk at this time.

It was mentioned in this paper that the veterinary profession should get together, that if three veterinarians were to give their advice, there would be three different programs to follow. No doubt that is true, but in view of the experience and knowledge that we have at the present time, would you expect anything different?

Also, he mentioned the fact that he was part manager of a herd of 140 and that he would rather see a man come and steal those animals than to inject live vaccines. I am not in a position to know whether or not we have any live vaccines in use at the present time, but we have those that are called live. I know of several farmers who own herds as large or larger, that are troubled with this so-called Bang's disease. They go as far as to tell me that they are getting 100 per cent value returned on the use of live vaccines in the virgin heifers. I am neutral; I am not using them, neither am I advocating them. But I am like the fellow who was put in jail. He sent for his young attorney. The attorney came and talked with him. He said, "Why, John, they can't put you in jail for what you tell me you have done."
The young man said, "Hell, I don't care anything about that. I am in jail. What I want you for is to get me out."

This brings me back to just the position I find myself in. We have several herds in New Hampshire and, while it is a small state, we are shipping into the Middle West. We shipped two carloads to California. We ship to foreign countries, and we are shipping into several states that require the agglutination test. We have abortion in New Hampshire. We have several herdsmen who have asked me to issue certificates that they are free from contagious abortion. They have passed two yearly negative tests. Yet the fact remains that we can take blood samples, send them to some laboratory and get reactions. We can send them to others and get clean tests.

This last summer, because we were pressed to do it, six of our leading veterinarians were called into the office and asked to take blood samples from several herds of cattle, some that were known to have been vaccinated with the so-called live vaccine. Six laboratories were selected. Only one was located in New England. We are small back there, so I am putting this in so you will not think we do not know our business. The five others were located outside of New England. Two of them were commercial laboratories and the rest were experiment stations and state laboratories.

The samples were drawn and divided into two parts and mailed to these laboratories. The only two laboratories that agreed were the United States Government laboratory and the New Hampshire Experiment Station. The others came back anywhere from 10 to 50 per cent, and not suspicious but negative and positive.

The other day a man who has had three clean tests and never has had any reactors in his barn, had a test made, and our college said four reactors positive. He was very much disturbed, so he had his veterinarian, a very high class man, draw the samples. This man was a Cornell man, so he sent them to Cornell and to a classmate of his who runs a laboratory (I do not know who he is or anything about him) somewhere in Maryland. Both samples came back negative. He rushed into the office and said, "Here are two against one. You have to give me a clean herd."

"We cannot do that until we talk to your veterinarian."

In the meantime he was going to buy eight. He went into the state of Vermont and made an agreement with the dealer in Vermont that these animals must stand a negative blood test at least sixteen days after freshening. They agreed on the laboratories of Harrisburg, Pennsylvania, and Cornell University. He sent the blood samples and when they came back, one said they were positive and the other said they were negative.

He came into the office and said, "Well, do you know any more than you did last week?"

I said, "No, and you don't know as much."

He told me that when he buys cows he is going to have the University of New Hampshire make the blood test and when he sells them he is going to have some other laboratory make the test. (Laughter)

Gentlemen, I do not know anything about this question. I am just telling you the facts that we are confronted with in the field. As regulatory officials, this thing is being crowded onto us. You ask us to get together and follow the program. If that program is yours, it is o. k. If it is somebody else's, it is not o. k.

If we do not know anything about this Bang's disease, let us admit it. If we do, let us admit it. Let us give a little credit to the fellow who is out in the field carrying on all this work and getting results.

I am not advocating the vaccination of cattle because I do not believe that it is in any program to eradicate disease. I am going to tell you men that when farmers come into the office and tell you, almost 100 per cent, that they are getting results, you have to give some consideration. (Applause)

Dr. L. F. Retzer: I should like to ask how those samples were sent, whether they were preserved and who took the samples.

This story has been told a dozen times, and every time it has been told in a different way. I am one of those who believe in the blood test. I know there are many here who have had perhaps as much or more experience than I have had, who believe in the blood test. But we do not believe in the human element.
in connection with the blood test. That is the secret of the whole thing. Anybody can take a blood sample. It goes to one-half dozen laboratories. You can do so much with the blood test and take it in so many ways. You can send it in so many ways. But I do not believe those data are acceptable, necessarily, because they are different or because some of those samples were tested by acknowledged laboratories. There is as much difference as the North from the South Pole in the nature of samples that are sent over long distances during warm weather or in warm trains or held in warm post offices. I have been through this for years. I am not interested in any particular herd. I am not violently opposed to vaccination. I have never taken a stand against it.

I think our efforts should be applied where infection is perhaps widespread in a herd. It is so easy to get samples which would on the surface discredit the test; it is so hard to send those samples, and it is a thousand times harder to get the samples tested in the right way, according to standard methods. The indiscriminate taking and testing of samples has done irreparable harm. I will admit there are discrepancies. Some animals will turn negative when they have been positive. That is true in connection with any disease for which we have a serological test. You cannot expect an infection to make a uniform invasion into animals. Where an animal is more or less strongly resistant, you are bound to get even a positive and a negative at times, as you do in any other disease where the infection is not confirmed or established. It is so easy, I say, to cite instances of this sort. I think it is unfortunate that we do not know more about these samples, the way they have been taken, and whether they are preserved when they are sent over long distances, and who gets the samples and who makes the test of the samples.

DR. SMITH: That is just the point. The gentleman said we do not have any standard. I am not questioning that a cow can react today and not tomorrow. The question is, these samples were taken at the same time and divided so that they would be the same in one laboratory as another. All that I know is they arrived in good condition. The six best veterinarians in the state of New Hampshire took them according to the instructions sent them from the different laboratories. That is all I know about that. But I do know that I have been coming out here for eight years; I have been here twenty-four hours, and this condition is all over the United States, or if it isn’t, there is an awful lot of liars in the room. (Laughter)

DR. PETER BAARNSEN: Mr. President, there is an old saying, “There is nothing new under the sun.” The conversation we have listened to, on the part of Dr. Smith, I have heard time and again applied to other diseases. Fifteen or twenty years ago you could have heard just exactly the same expression that he has made, with reference to the control of contagious abortion, except they would have said tuberculosis. There was nothing standard about it; you could not depend on it, and we should not be too fast. “Give us time and we will get the thing adjusted.”

The simple fact of the case is that contagious abortion must be controlled. If there is anything faulty with our standard, if there is anything faulty with our technique, it is up to us as veterinarians to remedy it. The disease must be controlled. (Applause)

MR. HARMON: There is one other point in that connection that I should like to mention. Last winter I was in the laboratories of the University of Minnesota going over the work with Dr. Fenstenmacher who was doing the testing there. He had a complaint similar to the ones that have been mentioned. One laboratory gave one report and another laboratory, which was supposed to have half of the same sample, gave another report.

Dr. Fenstenmacher said, “I have no doubt that those two reports went back contradictory, but there was something else wrong. Those fellows were taking a lot of samples out in that herd. When they divided the samples they may have infected one of them and not the other. They were taking a lot of samples, and they may have misnumbered them, or possibly the misnumbering was done in the laboratory.” As far as the testing is concerned, they were accurate. The thing for the veterinarian to do is to be positive that the samples are rightly taken and rightly numbered. I believe a good share of the trouble is eliminated right there.
Dr. Smith: One swallow does not make a summer. I grant everything you have said and also everything this gentleman said, that this is an entirely different proposition than the tuberculin testing of cattle, because it goes through a good many hands before it gets back.

I do not want to be misunderstood here at all. I am in favor of the control and eradication of contagious abortion through the testing of cattle and the removing of the reactors. But I tell you we have been standardizing this thing for eight or ten years. We were not that long standardizing the tuberculin test after we once started in, and you know that.

Dr. Bøhnsen: Only about twenty years. (Laughter)

Dr. Smith: There were no rules, laws or regulations or anything else on tuberculosis until 1916 or 1917. I took over the work in 1920, and we have not changed one bit since then, to speak of. We have not eradicated tuberculosis. Seventy-five per cent of the cattle are under our supervision. We have the infection. As I said before, I do not want to be misunderstood, but I do believe that it is time that we get this thing standardized and know where we are. You cannot blame the veterinarians out in the field, because if you do not do something, the farmers and the veterinarians are going to select their own course and go their own way, and we are going to have a much more difficult job to bring about a standard.

Dr. A. T. Kinsley: This certainly has been interesting. It may be unfortunate that certain regulations have been put on by certain states before this test has been standardized. We have had some experience at a public market. We have had different laboratories make tests, with the same problem of different findings. What are you going to do concerning those shipments, some of you gentlemen who are in the laboratories? Here is presented to you today a string of 500 cows to be given the abortion test before they can go to Iowa or to Indiana. The test is applied. Perhaps we have this irregularity. We will take for granted that the test is correct and that only negative animals are shipped. One man from Iowa told me that he had a carload of such animals shipped in. I think seven or eight weeks after they had been shipped into his herd, the cows that had been tested and sent in all began to abort. He said, “You fellows are all crazy.”

I asked him if he had abortion in his herd. He said, “Yes.” In other words, clean animals had been sent into an infected herd. I say, “Isn’t it unfortunate, after all, that these regulations have been put into effect before the test has been really standardized?” I think that every laboratory in the country should be provided with the antigen that gives the very best result. It should be made as nearly uniform as possible to evade all of these difficulties and to overcome the lack of confidence on the part of the cattlemen. A lot of them are laughing at all of us today, partly because of these regulations, that probably are just a little premature, before they are ready to give them service. (Applause)

Dr. M. F. Barnes: Mr. Chairman, I just want to say that in Pennsylvania we sent out five sera to twelve different laboratories situated in twelve different sections of the United States. When those reports came back, according to our method of interpreting results, they checked 100 per cent.

We agree in Pennsylvania that there are differences in results obtained by different laboratories, but our greatest difficulty has come when the veterinarian himself starts to juggle with samples. We have had more differences right in the state of Pennsylvania than we have had in checking against other laboratories. Those differences have always come where the veterinarian attempted to juggle the samples, something that is not solid and will not stand juggling.

The gentleman says our tuberculin testing has been standardized. In Pennsylvania we have been testing for infectious abortion under the same plan, by the same method, for the past nine years. Nine years ago we had one herd certified and were testing six. Today we are testing in 3,000 herds; 275 are certified free and 1,000 are signed up for the test. We have had only four breaks in those 275 certified herds. Those four breaks are all accounted for by failure to carry out certain requirements of the plan. We never have asked a
breeder to test his herd of cattle yet. What those fellows out in the field are
doing, as this gentleman said, is demanding that we test their herds. The chief
trouble at the present time is among the veterinarians. We could be testing
twice as many herds as we are today if the veterinarians were all agreed. We
are now testing at the rate of about 60,000 samples a year. (Applause)

PRESIDENT LAMB: I want to thank you for injecting some pep into this
meeting, Mr. Harmon.

We will proceed with the next paper, which is "The Relationship of Human
and Animal Bruceliiasis," by Dr. H. E. Hasseltine, U. S. Public Health Service,
Washington, D. C.

Dr. Hasseltine read his paper.

THE RELATIONSHIP OF HUMAN AND ANIMAL
BRUCELLIASIS

By H. E. HASSELTINE, Surgeon

U. S. Public Health Service, Washington, D. C.

At your meeting one year ago, this subject was presented most
admirably by our distinguished colleague, Dr. Veranus A. Moore. He
covered the subject so thoroughly that it would be difficult to
add anything to his paper except from information that has been
published or obtained since that date. The terms "brucellosis" and "brucelliasis," signifying the state of being infected with
Brucella, have appeared in the literature during the current year. The
terms are synonymous, though the latter is pronounced the
preferable one by classical scholars.

You are all familiar with the happenings of the past five years,
which have linked the occurrence of undulant fever in man with
the presence of infectious abortion in live stock. All this work is
traceable to the work of Evans, who, in 1918, pointed out that
the Micrococcus melitensis of Bruce and the Bacillus abortus of
Bang were similar in their morphological, cultural and serological
characteristics, their likeness being as close, if not closer, than
that of B. typhosus and B. paratyphosus.

However, I wish to refer to history for a brief moment to call
your attention to quotations from two articles from the pens of
men whose scientific observations and deductions led them to
make statements, which in the light of our present knowledge
may be classed as prophecies. Fortunately all lived to see their
predictions fulfilled, though recently one has been claimed by
death. I refer to the work of Schroeder and Cotton, the con-
clusion of whose article, on the finding of the B. abortus in milk,
reads as follows:
What the real significance or practical importance of this bacillus, the presence of which in milk appears to have escaped detection in the past very likely because of the difficulties associated with its artificial cultivation and the length of time it requires to cause well-marked lesions in guinea pigs, may ultimately prove to be we are unable to say. But no one can doubt that the common occurrence of a microorganism, pathogenic for any species of animal, in an article of food as widely and as extensively used as milk, deserves that we should study it with the greatest care, especially after it has been shown that it is an organism which has the udders of apparently healthy cows as its normal habitat, and which therefore can not be certainly excluded from milk, no matter how much cleanliness and care are used in its production. In this sense the germ forms another link in the long chain of facts that point unmistakably to the proper pasteurization of all milk before it is used as food as a measure essentially necessary for the protection of public health.

The other is by Craig, who, in 1905, in reporting the first case of Malta Fever in the United States, made the following statement:

I am convinced that a careful study, by use of the Widal test and the agglutination reaction with Micrococcus melitensis, of many of the cases of obscure continued fevers which are prevalent in this country will result in the demonstration that Malta fever is by no means a rare disease in the warmer portions of the United States, and that many of the so-called anomalous cases of typhoid fever are in reality instances of infection with the organism of Malta fever.

Though for the past five years the conditions surrounding the disease known as undulant fever and its relation to live stock seems to have been in a rather chaotic state, we are rapidly evolving order from the jumbled mass of evidence. Important connecting links in the chain of evidence are being forged and basic work is being tested and broadened.

**Present Status of the Disease**

Without attempting to refer to literature, let us see where we stand at the present time. In the United States it seems fairly well established that there are three organisms of the bacterial genus Brucella that infect live stock, the *Brucella melitensis*, whose host of preference seems to be the goat; the *Brucella abortus* in cattle and *Brucella suis* in swine. You will note that I use the names proposed by Huddleston in order to avoid confusion that arises out of the use of certain adjectives in describing the organism and its source. It is probable that more strains of this genus will be discovered. Whether these three species of Brucella are capable of infecting all mammalian animals is a question not yet determined. There is good evidence that these three strains may infect cattle, and in this country, where beef is the most frequently used meat, and milk, butter and cheese are consumed in large quantities, this alone makes the question of any disease in cattle a factor to be considered in connection with human
health. As pork is the second variety of meat in frequency in the American diet, disease in swine is also an important consideration. While we are not certain that swine are infected with strains of Brucella other than Br. suis, this strain has been found to be more pathogenic to man and laboratory animals than has B. abortus.

The infection in goats is a direct danger to the health of a comparatively limited area in the southwestern United States, where goat-raising is an established industry. However, there seems to be a tendency to extension of goat-raising, particularly milch goats, to other sections and this may result in the spread of brucellosis by these animals. But another far greater danger lies in the possibility of the caprine strain of organism spreading to cattle and swine and these in turn carrying the infection to various parts of the United States through movement of live stock. I expect that one would find difficulty in tracing back to its source the infection carried in such a manner. There is rather suggestive evidence that the Br. melitensis (caprine strain) already exists in cattle in some sections far removed from the goat-raising regions of the Southwest.

**Three Strains Isolated from Human Cases**

The three strains of Brucella referred to above have all been isolated from human cases of undulant fever in the United States. The Br. suis (porcine strain) has probably been obtained with greatest frequency because of the easy task of isolating the first culture and also because of its more frequent occurrence than Br. melitensis. The Br. abortus (bovine strain) is the most difficult of these to isolate from human cases because of its requiring special cultural conditions to obtain an optimum environment, and by the observed fact that it is less pathogenic to man and laboratory animals than the other strains. Its recovery from human cases is reported by Orr and Huddleson,6 Hardy,7 Simpson,* of Rome, has reported that human blood is bactericidal to Br. abortus, but not to Br. melitensis.

The isolation of the three strains of Brucella from cattle has been reported, though most of the organisms recovered from cattle have been Br. abortus or Br. suis. They have also been isolated from milk; the Br. melitensis from goats' milk, and both Br. abortus and Br. suis from cows' milk. Simpson reports the isolation of the same strain from human cases and from the milk supply used by the patients.
It has been stated that there is no direct evidence that undulant fever in man is transmitted by milk. Interpreting the term "direct evidence" in a strictly legal manner, it is conceded that the statement is correct. Though we have been able to isolate Br. abortus from milk with reasonable consistency, we have not been able to determine the exact time the patient received his infection. Except in experimental cases (and we do not experiment on human beings if susceptible animals are available), it is impossible to secure direct evidence of the source of a case of infectious disease when an incubation period is required for its development. To obtain direct evidence, it is necessary to prove that the infection was received from a certain source at a certain time and the time factor is ruled out by the necessary incubation period.

However, we are able, by the accumulation of circumstantial evidence in a sufficient number of cases to establish quite conclusively the methods of transmission of most communicable diseases and as the number of cases investigated becomes greater, the evidence becomes stronger. As these matters follow certain natural laws, we will not find nature consistently giving false indications. By this procedure we have determined the method of transmission of typhoid fever to the satisfaction of both the scientific and lay world.

Remembering this preliminary statement as to the kind of evidence available, let me call your attention to several circumstances indicating the relation of human undulant fever to the presence of one or more strains of the Brucella genus in one or more species of animals that are collectively spoken of as live stock.

**Geographic Prevalence**

The geographic prevalence of undulant fever in man and that of brucelliasis in live stock are, from present indications, practically identical. Undulant fever in man has been reported from 46 states and the two not reporting its presence are widely separated. It is probably present in at least one of these, but has not been reported, or perhaps not recognized. In certain sections of Europe the geographic coincidence of the human and animal infection is quite noticeable.

Whether the apparent increased prevalence of undulant fever in man is due to an increased prevalence of brucelliasis in animals is impossible to determine. We know that infectious abortion
has been present in live stock for years, yet it was not until Evans pointed out the similarity of the organisms of infectious abortion and Malta fever that the disease was recognized in man, except in the goat-raising sections. This suggests that the disease probably has been present for several years but not recognized. When Evans' work supplied the key to the problem, that is, to look for a febrile disturbance rather than abortion, the disease was soon recognized and its diagnosis is becoming more frequent every day. In my work I have met many physicians who can look back to febrile cases that puzzled them for long periods and finally recovered without a fully satisfactory diagnosis being made. Many remark on the similarity of such cases and undulant fever.

THE ROLE OF MILK IN THE SPREAD OF THE DISEASE

The fact that undulant fever in Malta was found to be transmitted almost entirely through goats milk very naturally led scientific and sanitary workers to suspect that the milk of cows infected with abortus disease was the channel through which the infection was spread. This suspicion was strengthened by the already demonstrated presence of Br. abortus in milk, although it was not considered pathogenic to man at the time this fact was ascertained. The accumulation of epidemiologic evidence that undulant fever may be transmitted by milk is sufficient to convince any unprejudiced person that raw milk containing living Brucella organisms is responsible for many of the human cases of undulant fever. The extremely low incidence of undulant fever in cities having a large percentage of their milk pasteurized is well known. This is emphasized by the report of a case in New York City in an employe of a pasteurization plant, who admitted drinking milk in the plant before it went to the pasteurizers. In Washington the disease has been reported only in laboratory workers. San Francisco is also free of the disease. Approximately 90 per cent of the persons interviewed by me, who have suffered attacks of undulant fever, state that they have used raw milk. About one-half give no other probable source of infection. I might cite one or two instances where the transmission through milk seems quite well demonstrated.

Case 1: The wife of a professional man living near a large city was taken sick with undulant fever. Their regular milk supply was from a family cow maintained on the premises. The patient did not drink milk regularly, but used cream from the milk very freely and also made butter from the excess cream. She did not care for the cow or do the milking. Upon application of the agglutination test the cow gave a positive reaction in high dilution. Later a culture of Brucella was isolated from this cow's milk.
Case 2: A young lady employed in a large city returned to her father's farm to spend the Christmas holidays. Three to four weeks later, she was taken sick with undulant fever. Her milk supply in the city was pasteurized; at her father's home it was from two cows maintained on the farm. She had no contact with the cows. Both cows gave a history of having had abortions. One of the animals was sold before any tests were applied to the cattle. The other gave a positive agglutination in 1 to 5120 dilution and Br. abortus was isolated from her milk. The testing of this animal was carried out after a second case, a brother of the patient, suffered an attack of undulant fever about eight months later. He also used milk from these cows but did no work that brought him in contact with the animals.

Case 3: A middle aged man, financier, taken sick in August, 1929. Has his own family cow, maintained at home, but cared for and milked by employees. Used little milk as a beverage, but used small amounts for table purposes and used considerable ice cream made from cream from the family cow without any heating of the mixture. The cow was tested and found to be a reactor.

In these cases the finding of infection in the cows makes the evidence much stronger. It is not always possible to get such evidence in case of milk supplies coming from herds at a distance and when milk of different herds is mixed at city plants. It is worthy of note, however, that the vast majority of cases give a history of using raw milk.

The Infected Cow a Probable Danger

Probably the infected family cow is a greater danger to the consumers of the milk by reason of the larger dosage of organisms in the milk, the benefit of dilution of milk of infected cows with that of non-infected cows being lost. Blackford and Cason recently reported a case indicating that the infection was received from two cows owned by, and supplying milk to, the patient.

Among other reports of milk-borne undulant fever appearing in print during 1929 is one by Bellinger and Levin, of Oregon, who report six cases occurring in a state tuberculosis institution, using raw milk from the institution's herd in which infectious abortion was known to exist in some of the cows.

I have also seen three cases in a tuberculosis hospital of another state, two in bed-fast female patients, the other in a male member of the medical staff. None had any contact with the institution's herd other than through the free use of raw milk therefrom. On the other hand, I have found one state penal institution that had 70 per cent of the milking cows of its herd react positively, yet but one case of undulant fever has been recognized therein. However, it should be stated that milk is not used as a beverage except by those in the infirmary.

Not all cases of undulant fever in man are received through milk-borne infection. A small percentage occur in laboratory
workers who apparently receive their infection in some manner in the laboratory.

There seems to be no doubt that contact incident to milking, feeding, caring for and shipping infected animals may be one of the methods of contracting undulant fever. The prevalence of the disease among farmers may be due largely to infection received in this manner, though in a vast majority of cases they also consume raw milk from their infected animals. The experience of Hardy, in Iowa, where hog-raising is a more prominent industry than in any other state, suggests that a number have been infected by contact with infected swine, both on the farm and in the packing-houses. I have found two cases that used only pasteurized milk whose infection traces very definitely to contact with swine. One was employed as a tail-bleeder in a hog cholera serum plant; the other as a plumber and steamfitter in a packing-house, whose duties frequently required him to open drain pipes that had become plugged with blood-clots, bits of meat, etc. A third patient, who used only canned milk for one year prior to the onset of illness, worked in an establishment near a large eastern city where garbage was fed to about 10,000 hogs. The establishment also maintained about 2500 brood sows and had recently imported some brood sows from Iowa in order to build up their breeding stock. No other animals were kept on the place. A culture of \textit{Br. suis} was isolated from this patient, who finally recovered after a severe illness of nearly five months duration.

\textbf{Veterinarians Exposed to Infection}

An operation that seems particularly dangerous to farmers and veterinarians is that of removing retained afterbirth from infected cows. A number of cases that I have interviewed have given a history of such exposure shortly before they were taken sick. It is probable that the infection can pass through the unbroken skin and this operation exposes a considerable area of the operator's hands and fore arms to direct contact with the infected genital tract. If there are cuts or abrasions of the skin, the chances of infection are increased.

Now what can the health officials of the country do to prevent human beings from contracting undulant fever? The milk-borne infection can be controlled by pasteurization of milk in communities to which such procedure is applicable. There are other reasons besides the prevention of undulant fever that make pasteurization of milk desirable. It is our most effective measure...
to insure the absence of viable pathogenic organisms in milk and its wider employment is urged. However, at the present time it is not a practical procedure in rural sections and in small villages, and a considerable portion of our population lives in these surroundings. Of course pasteurized milk may be accidentally infected if handled by carriers of infectious disease or if placed in infected containers after pasteurization.

To prevent the contact infection, at the present time our chief method lies in education of those whose occupations expose them to the particular hazard, as to the nature of the disease and such preventive measures as may be indicated in their individual cases. During the past year the state veterinary authorities of Iowa have cooperated with the health officials by making tests of all animals on farms where undulant fever has occurred, if the owner of the animals was willing to have such tests performed. This will give valuable information when their reports are finished.

There is a method involving a colossal amount of work, which will prevent human undulant fever and at the same time prevent the enormous losses now sustained by the livestock industry. That procedure is the eradication of brucelliasis from live stock. Last year Dr. Moore1 told you that milk “consumers are in no danger from this organism in the milk if the cows that produce that milk are not infected.” To this I would add that you can not acquire the disease from animals that do not carry some member of the Brucella genus.

CONTROL MEASURES CAN REDUCE THE INFECTION

Although final eradication is a long way in the future, control measures whose final goal is eradication can materially reduce the infection so that human undulant fever cases will be much less frequent. The producers of certified milk in California have already added to their requirements a provision that all certified milk shall be from cows that do not react to the agglutination test for Br. abortus. I am informed by reliable authorities that about one per cent of cows that eliminate Br. abortus in their milk may give a negative agglutination reaction. Assuming that all cows yield the same amount of milk, the dilution in herd milk (1 to 99) will probably reduce the chances of infection to a point where human undulant fever would be extremely rare. Repeated testing of such herds is necessary, at least for a number of years, for the one per cent of animals not found by the first test would
probably be picked up in subsequent tests. Such animals might reinfect the herd, if retesting were not practiced.

It is unnecessary for one to discuss the plans for eradication of abortion disease further than to say that I have talked with veterinary and live stock authorities in a number of states and the trend of their opinion has been that eradication is possible and practicable. A few have been pessimistic, but what worthwhile procedure does not have its supporters and opponents? The veterinary profession has made wonderful progress in an even greater project, the eradication of tuberculosis, and there is every reason to believe they are capable of accomplishing similar results with infectious abortion.

For the period required to bring about this eradication we must make use of all preventive measures at hand. As already stated, education of all and particularly those whose occupations subject them to danger of infection with brucelliasis is to be carried on. Pasteurization of milk is to be advocated as a final measure of insurance against all infectious diseases that may be carried by milk.

In my talks to various groups interested in undulant fever, I am advocating these three prevention activities: education of all, pasteurized milk, and eradication of the disease in live stock, with the last the final goal. In your efforts to attain this goal I pledge you my whole-hearted support and cooperation, and I feel safe in adding that of public health officials and that of the medical profession as a whole.

REFERENCES


DISCUSSION

Dr. HASSELTINE: I was asked if I had figures on the number of cases of human undulant fever in the United States. It has been very difficult to get physicians to report their cases to their respective state departments of health.
However, Dr. Hardy, by means of a questionnaire to all of the states, obtained figures for the United States, as follows:

1925 ................................ 24 cases
1926 ................................ 46 cases
1927 ................................ 217 cases
1928 ................................ 649 cases
1929 (to June 1) ..................... 365 cases

Beyond that I have no figures other than cases which are reported to the Surgeon-General of the United States Public Health Service, by state health departments, for the months of June, July, August and September. There were about 375 cases, as follows:

June .................................... 63 cases
July ....................................... 77 cases
August ................................... 77 cases
September .............................. 151 cases

The reports for October have just begun to come in.

My figures run back to June, 1927, and, barring small variations each month has shown an increase over the month previous. For that reason it is impossible to say anything about seasonal prevalence as yet. Conditions apparently point to the fact that it will be found more prevalent in the summer and early fall. . . . (Applause)

PRESIDENT LAMB: The next will be the report of the Committee on Abortion, by Dr. C. P. Fitch. (Applause)

Dr. Fitch read the report.

REPORT OF COMMITTEE ON ABORTION

Dr. C. P. Fitch, Chairman, St. Paul, Minn.

Dr. George H. Hart, Davis, Calif. Dr. J. F. DeVine, Goshen, N. Y.

Control of bovine infectious abortion has proceeded satisfactorily during the past year. It is very encouraging to compare the report of your Committee on Abortion of four years ago, with the situation that exists in the United States today in respect to this disease. In 1925, your Committee reported that two states had adopted regulatory measures to prevent the introduction of the disease by cattle purchased and coming into these commonwealths from other states. These regulations required a health certificate, stating that the blood of the animal had been tested serologically and that no evidence of infection by the Bang organism could be found. One state was doing accredited herd work with the disease and several commonwealths had educational work in progress. This represented the efforts to control the disease officially.

Now, 1930, nine states and the Territory of Hawaii require a health certificate based upon the blood test. Seven additional states will not permit the entrance of animals which are known to give a positive reaction to the serological test for Bang's disease. Nineteen states have definite regulations governing the control of infectious abortion. Twenty-four states still have no regulations regarding the disease, but it is interesting to note that sixteen out of these twenty-four have regulations which they are about to adopt or are pursuing educational campaigns working towards the control of this infection. Six states prohibit the sale of known infected animals within their confines, except under permit from the live stock sanitary authorities. Eleven states are doing work on the accreditation of herds free of Bang's disease.

The progress that has been made during the past year indicates that nearly all of our commonwealths are fully aware of the dangers of this infection and are formulating rules and regulations looking towards its control. As was pointed out by your Committee several years ago, each state has its own individual problem and as your Committee advised, each sanitary official should study his own problem and put into effect rules and regulations which are advisable under the circumstances that exist in his state. The above report indicates that sanitary officials, in general, have done this.
There are five things that your Committee this year desires to call particularly to your attention:

First: It has been definitely demonstrated that, up to the present time, the only method which has been clearly shown as satisfactory for the control of this infection is the clean herd on the basis of the serological tests. This brings these tests definitely into the limelight, and several things in regard to them should be considered.

The Committee on Abortion of the American Veterinary Medical Association recommended in its report, which was accepted by the Association, that a committee be appointed, looking toward the standardization of these tests. The American Veterinary Medical Association Committee stated that in their judgment this should be a combined action, or should be referred to three organizations, namely this Association, the Conference of National and State Experiment Station Workers in Animal Diseases, and the Committee on Abortion of the National Research Council. It seems to your Committee that this recommendation is a good one. The serological tests do need standardization. If such tests are to be used for the interstate traffic of cattle, it is absolutely necessary that they be made as uniform as possible. This was demonstrated when the intradermal tuberculin test was adopted generally by the states and was used as a test for the interstate movement of live stock. Your Committee therefore recommends that this Association either appoint a special committee on the standardization of the tests or refer it to the Committee on Abortion to be appointed by the incoming president, with power to act, and also to instruct this committee to cooperate with the two organizations mentioned above.

Second: During the past year, several additional states have made the requirement of a Bang's disease health certificate for entrance of cattle into their commonwealths. We believe it would be a wise thing for the sanitary authorities of the different states that are contemplating action of this kind, or in fact, that are contemplating any regulations in regard to the control of this disease, to communicate with the sanitary authorities of other states in that such laws or regulations be as uniform as possible. We believe that the time has come when as uniform rules and regulations as possible should be adopted generally in the United States in respect to the interstate movement of cattle as far as this disease is concerned. We believe the states in different groups can get together advantageously, talk over their problem, and initiate either rules, regulations, or laws governing the control of this disease. Such group meetings have already started. The veterinary sanitary officials of California, Idaho, Nevada, Oregon and Washington met in Oakland in November, 1928. Pennsylvania, Maryland and New Jersey met very recently, and are projecting work, looking towards uniformity. We believe that this is an important point and should be carefully considered by the sanitary officials of all states.

Third: Last year your Committee presented a very detailed report in regard to the preparation of live vaccines. Data presented in this report indicate clearly the great variation in manufacture of these products. This year, at the meeting of the American Veterinary Medical Association at Detroit, Doctor Hallman and his co-workers presented a report in respect to the so-called "avirulent cultures" that were used commercially, for immunization against Bang's disease. This report was based on a study of nine commercial vaccines. Their data indicate that all of those studied were either dead or virulent. Your Committee desires to state that the use of living vaccines, which are virulent or which may become virulent, is a dangerous procedure. We recommend that their distribution be prohibited. This is stated, not only because of the relation of the use of these products to the control of the infection in cattle and other species of live stock, but because of the added danger of the transmission of the infection to human beings by their use. We do not imply by this that vaccination as a method for the control of Bang's disease is not worthy of study. We do state most emphatically, however, that it is still in the experimental stage and should be kept under close supervision of competent research specialists.

Fourth: Your Committee is fully cognizant of the notoriety which undulant fever has gained during the past year. Presentation of this subject, at this meeting, has been delegated to the Public Health Service of the United States. You have already listened to this presentation. Your Committee again wishes
to call your attention to the fact that there is no doubt that cases of undulant fever occur in man which are undoubtedly contracted in laboratories, through milk and its products, and through contact with affected cattle and swine. Your Committee further wishes to state, however, that in its judgment, it has not been definitely proved that any one source is the most important method of transmission of this disease to man. Further, we wish to state that investigations of cases of undulant fever in man, not only from the epidemiological standpoint, but also from the bacteriological and pathological standpoint, are absolutely necessary, and we earnestly recommend that the agencies doing investigational work in this field, pay particular attention to these phases of the study of undulant fever.

Fifth: As a final recommendation, your Committee desires to call the attention of those commonwealths which are still allowing Bang's disease to proceed unattacked, within their confines, that it is exceedingly urgent that they adopt rules and regulations, or educational procedures, looking toward effective control. The basic facts which underlie the successful control of this disease have been pointed out to this Association for several years. They remain as facts today. They have stood the test of time. They await your use as a basis for the adoption of control measures. The merits of the agglutination test, its possibilities and limitations, the value of segregation of the non-reactors and the procedure of raising herds free from the disease should be constantly kept before those whose duty it is to protect animal health. The live stock industry of this country will shortly demand that you adopt the proper rules and regulations for the control of this disease within your state. Further delay will serve only to bring additional burdens upon the cattle industry of your community.

DR. FITCH: Mr. Chairman, I move the adoption of this report. (Applause)

DR. M. F. BARNES: I second the motion.

PRESIDENT LAMB: The question is upon the adoption of the report of the Committee on Abortion. Is there any discussion?

DR. W. J. BUTLER: Do you, or do you not, recommend the promulgation of regulations requiring a blood test on cattle moved interstate?

DR. FITCH: We make no recommendation on that point.

DR. BUTLER: Will you decide one way or the other?

DR. FITCH: I could give only my own viewpoint in that regard.

DR. BUTLER: I notice you did not make any definite recommendation. That does not help the regulatory officer very much.

DR. FITCH: I do not think we are ready for a recommendation of that kind. I do believe we have answered that question, in a great measure, by requesting that the states and different groups having similar problems get together and discuss these problems, and many of those things will clear up. If that had been done, some of the laws and regulations which are now impeding progress would never have gone on the statute books.

The question was put to a vote and carried.

The meeting adjourned at 4:50 p.m.

THURSDAY MORNING, DECEMBER 5, 1929

The third session convened at 9:45 a.m., President Lamb presiding.

PRESIDENT LAMB: The first section of this morning's session is for the expression of individual opinion concerning live stock sanitary problems prevailing in the various states and will be in charge of Mr. J. H. Mercer, Live Stock Commissioner, Topeka, Kans.

Mr. Mercer, will you kindly take the chair and conduct the meeting on this subject?

Mr. Mercer took the chair.

CHAIRMAN MERCER: This part of the program is something out of the ordinary, as far as I know. When Dr. Dyson asked if I would act as chairman of the meeting this morning, I, of course, asked him what he had in mind. He
said that his idea was for the state sanitary officials to discuss in any way they chose the work in their respective districts of the country. It was not confined to any restricted program.

While we will not have a great deal of time, yet it will be my plan to conduct the period this morning in such a way that it will not be embarrassing to anyone. We will probably confine the talks to a few minutes.

I think it would not be out of place for this organization to have a full day of just such a program, and to provide subjects to be discussed.

I have been attending these annual meetings for eighteen years. I have been in charge of the sanitary department of my state for twenty years next April, and have missed but one meeting of this organization. It has often been my thought as a layman that we did not discuss pertinent questions of sanitation as we should. I have sat here and listened to scientific papers that were entirely over my head and of no consequence to me as a sanitary officer. Sometimes I have wondered, if it were not out of place, that we ought to have more practical talks with respect to sanitary matters. We have been coming back to the practical side of it more in later years.

Gentlemen, there are some major projects in Kansas in which we cooperate with the federal government and Bureau of Animal Industry—three projects at least, tuberculosis eradication, mange eradication and hog cholera control. These constitute the major projects in live stock sanitation in our state. For four or five years now, the tuberculosis work has been the principal activity. The wonderful results of this intensive work in Kansas are outstanding. No activity in sanitary matters in our state has accomplished so much and been of such direct benefit to the live stock producers as the tuberculosis eradication campaign. It has brought our people, farmers and producers, in close contact with officers of the federal and state governments who are endeavoring to serve them. We have probably a little different method and plan out in Kansas than in some of the states and are making fairly good progress on a very economical scale.

There are forty-three counties in the State that are accredited, three or four now well under way for accreditation, and by spring we hope to have at least fifty-five to fifty-seven counties of the State on the free list.

We have a plan embodying certain procedure in starting the work in a county. We require an agency in the county, representing the dairy interests or the pure-bred live stock interests, or the county farm bureau, whatever it might be, to circulate petitions and secure the signatures of 85 per cent of the cattle-owners of the county. These petitions are listed with our department and are taken up in the order received.

Since the plan was inaugurated, we have been from five to ten counties behind with our work, so you can see that it has been well adhered to.

When we start in a county, of course, we first secure from the records lists of all the cattle-owners. We then allot certain territory to the local veterinarians. Nearly all of the local veterinarians are eager to take part in the tuberculosis campaign. A township is allotted to one man and a simple contract is entered into with the veterinarian which provides that he test all the dairy and breeding cattle in that township. The only limiting requirement is that the work must be done, usually within sixty to ninety days. Many of our local veterinarians test three and four townships in the respective counties. They are paid by the head. For several years we paid them only thirteen cents a head but now they are receiving fifteen cents a head. They may test two days in a week or four days or six days, if they choose. Under such an arrangement veterinarians may keep up their general practice in almost all instances. It has been my thought that local veterinarians who are diplomatic, in coming in contact with the farmers and stockmen of their localities may be benefited indirectly as much by reason of that as the financial gain obtained in testing.

Our state is divided into three parts. The federal government and the state department each have a certain territory. While men are engaged exclusively for this work yet we occasionally call on the local men to make investigations if there are outbreaks of consequence of scab, hog cholera and so forth. We do not have a great amount of hog cholera in Kansas. There are certain new
diseases, or uncommon diseases, that have developed in recent years which have given us more trouble than cholera. In such cases our plan is to quarantine the farm or area and post notices that the territory is under quarantine. We rigidly enforce the quarantines and require vaccination when necessary.

On these three projects, in cooperation with the federal government, splendid progress has been made in the state. Another situation in Kansas that is quite troublesome is rabies. It is somewhat difficult to control. Our plan of meeting an outbreak of rabies is by quarantine, requiring dogs to be tied up and muzzled for a period.

We have tested, gentlemen—and I do not know that this will sound well to the biological producer—and experimented with vaccines to control rabies. We are not satisfied with commercial biologics used in rabies control work. It is not recognized in Kansas, because I could show you many demonstrations which have proven unsuccessful.

During my long years in this work it has been my experience that the best results in live stock disease control work are obtained by knowing what to do and then getting the cooperation of the live stock producers in carrying out that plan. In combatting all live stock diseases, strict sanitation is the best rule for a sanitary officer to follow.

I want to leave one more thought with you, concerning this open discussion today. As far as I am concerned, it will have as wide a range as you wish. We are not going to confine anyone to a particular subject. With all due respect to the medical fraternity, they sometimes get out of their realm and sphere. The address that was made here yesterday, to my mind, was out of place.

The sanitary officers of this country, including the Bureau of Animal Industry, are making every effort possible to give confidence to the consuming public in the healthful condition of live stock which are slaughtered for food. Healthy conditions of live stock mean palatability of the products of live stock.

There has been heralded abroad, in the last few months, propaganda—to my mind propaganda—to my mind propaganda, as was demonstrated here yesterday in the discussion by a very able doctor—that we should pasteurize all the milk of the dairy herds of this country. It is my opinion, such general pasteurization is wholly impractical and unnecessary. I claim the medical profession is unwarranted in contending that in order to make milk and dairy products pure and healthful, such a procedure should be followed. The work of the sanitary officers of this country to bring about a healthy condition of live stock, and the efforts of the sanitary officers of the cities and the creameries, and everybody else, is sufficient to convince the public that rapid progress is being consistently and conscientiously made in furnishing pure healthy dairy and live stock food products.

I do not know whether you realize it or not, but I know that in my country propagandas of that kind is harmful to one of the most essential industries of our country—the dairy industry. I do not believe in publicity of this character with scare headlines.

Not long ago a very fine gentleman, the secretary of the State Board of Health of our state, gave out a statement about undulant fever that was printed on the front page of our dailies, and I am convinced that, as far as the dairy industry is concerned, that statement did more harm than all the propagandas that has ever been carried to our people with respect to the eradication of tuberculosis. The report made here yesterday, in my judgment, should not alarm anyone concerning undulant fever. I do not believe it would be harmful for this organization to publish its addresses dealing with such problems. I do not know whether you agree or not, but I claim that, because of our system and the sanitary methods that are being conducted by our federal and state governments and by our municipalities in connection with these food products, it is entirely out of place for the medical profession to propose and advocate that something else should be done. Ours is the work of specialized men, trained for a definite purpose.

You may now have an opportunity to discuss anything you wish with respect to the work of your state in live stock sanitary matters. No one has been selected and I have made no preparations myself; this is a slight departure from our regular practice. From the discussion that took place yesterday, it would appear that a meeting of this kind will prove of considerable consequence;
DR. N. F. WILLIAMS: I am rather surprised at the reluctance of representatives of the various states to bring up the problems that confront them. I hesitated myself, but we have our problems. We are exchanging letters every day on some matter that requires better cooperation between the states.

The matter of rabies is conspicuous in Texas. While our experience has not been in line with yours, we respect the views that you take on that matter. We find that the incidence of rabies in the country district of Texas, among the live stock, has been materially reduced since we have enforced the vaccination of dogs coming into Texas. Before we had any record of the dogs that came to our state, we had no idea how many dogs came nor where they went. We find that a year ago, in the month of November, 265 dogs were shipped into Texas, to the rural districts, principally hounds, from Illinois, Kentucky, Tennessee, with smaller numbers from other states. Missouri right now is shipping hounds into our state. Those hounds are coming in vaccinated, in the majority of instances, but I should like to call on the representatives of the various states to impress their veterinarians with the necessity of complying with that regulation in every instance. We hesitate to embarrass the shipper. We hesitate to embarrass the veterinary profession. But unless they will live up to those regulations, then it is our duty to embarrass them, and we are going to do it.

As far as vaccination is concerned, it has been a wonderful help in Texas in controlling, in the municipalities, the incidence of rabies, which is most alarming, because it involves the human family. At San Antonio, our largest city, with somewhat of a large Mexican population, with a consequent increased dog population, rabies was a very serious problem.

The expense to which the county and city were put, month after month, for treating humans bitten by rabid dogs was really embarrassing. San Antonio five years ago passed an ordinance requiring the annual vaccination of dogs against rabies with a single-dose treatment. Dr. King, of San Antonio, one of the real human and interested health officers, has told me that they have had cases of rabies among the dogs of San Antonio since that time and during those years but not one case in a dog that had been vaccinated. That is a splendid tribute to that product.

Dogs that get into the pound down there must be vaccinated before they leave. Gentlemen, I think you will overlook a very important factor in the control of rabies if you overlook this single-dose vaccination. The experts of the Pasteur Institute are beginning to give it a little recognition. The only grounds on which they challenge us is, "It is all right, except that we believe there are two strains of virus, and a vaccine made from one will not protect against the other." That is not supported by the facts in Texas. So much for rabies.

I believe, as your chairman has stated, that a great deal of damage has been done by the uncalled-for and unwarranted propaganda about pasteurization of milk and the condemnation of the raw milk supply because of what they are pleased to call undulant fever caused by the bovine contagious abortion organism. At the same time they cannot connect one case positively. They could not go before a court of justice and make the case stand up. Still, they will embarrass that milk supply which, to my mind, is the measure of civilization. The measure of civilization, gentlemen, rests in the ability of mankind to maintain that raw milk supply pure and wholesome. When we fail in that, civilization has reached its peak and is going to go back. That ameba that came from the ooze, that ameba that has gone through the generations and has reached its highest type today in man, embodied by that streptococcus that Dr. Fishbein mentioned yesterday, will have reached his crest and will go back.

When pasteurization becomes our only means of maintaining the milk supply, it will not be the milk supply that has brought this wonderful nation and similar nations to their present high peak; it will be a compromising civilization comparable, in a measure, perhaps, with the sterilization of water, robbed of some of the necessities to the welfare of the human family. That pasteurization will be supervised. The milk supply will have passed to where it should be, and the supervision will be placed in the Department of Agriculture, and that pasteurization will be supervised just as rigidly as the meat supply is today.

Gentlemen, that is the answer to that propaganda. (Applause)
CHAIRMAN MERCER: I see Dr. Bahnsen, an old-timer here. I should like to hear from him.

DR. BAHNSEN: Mr. Chairman, about the only thing I have on my chest, as you term it, is to discuss the problems that were brought up by Dr. Hasseltine yesterday.

The propaganda on the part of the Public Health Service in order to encourage and establish a general pasteurization of milk throughout the country is, in my opinion, not a very good piece of propaganda. Pasteurization of milk for some of the large cities is unquestionably necessary. Pasteurization in the rural communities and the smaller towns in most instances is a farce and is unnecessary, providing the proper sanitary precautions are taken in the production of milk. We know that when milk is from thirty-six to forty-eight hours old, even though it may have been handled in a reasonably sanitary manner, it may be necessary to pasteurize it. But when milk is less than twelve hours old and needs pasteurization, there is something radically wrong with the milk supply, and the remedy is not in pasteurization but in cleaning up the dairy farms.

I had occasion to talk to the Kiwanis Club of Savannah, a few days ago: The subject assigned to me was “Clean Milk.” As I stated at that time, and I want to reiterate it here, there are many people engaged in dairy farming who are too dirty. The problem for the sanitarians and for the public as a whole is to eliminate dirty folks from the dairy industry. If we have clean people, healthy cows and sanitary equipment, we need not worry about the few bacteria that are in all milk, nor need we pay a great deal of attention to the discovery, so to speak, of an occasional new disease.

I think Dr. Hasseltine’s deductions were absolutely erroneous. The limited number of cases he cited reminded me of an old Georgia cracker who had grown up in the back woods. He hated the town worse than anything else he could think of, so he did not go to town. When the children grew up, one of his sons moved to the city. For several years the prejudice would not let the old man go to visit his own children, but when the grandchildren came along he decided he would go to town and take a look at them. He came to town and they were glad to see him. They chased him around the city, took him to the show, and finally one good day some of the children said, “Grandpa, let us go to the soda fountain and get something to drink.” He said, “Children, I don’t know much about this drinking business in the city.”

“We will show you, grandpa.”

They took him to the soda fountain. The old man had never seen ice cream, never heard about it, but he was a game sport when the children said, “Grandpa, we will have ice cream. What will you have?”

He said, “Give me one, too.”

He chewed on the ice cream cone as best he could and did away with it. It was one of those stores that you see in the smaller towns, with two or three steps from the sidewalk to the entrance. As the old man stepped out of the store he fell and broke his leg. He went back to the country and said to his neighbors, “Those doggone city folks have the darnedest way you ever saw. They feed you something in a cone that they call ice cream. You eat one of them and it makes you fall and break your leg. I know, I have tried it.”

(Laughter)

I feel that Dr. Hasseltine should be less leading. He referred to the evidence in court. You know, the object in court is to lead your witnesses. I am sure that the medical profession frequently lead their patients to go ahead and agree with them on the symptoms they exhibit. Right here you can demonstrate the suggestibility of the individual to an alarming extent. Many people think superficially. They do not weigh the evidence in a fair balance. If you suggest, “Perhaps this is your trouble” or “Perhaps, that is your trouble,” the patient will agree with you and say, “That is right. I expect it is.” If they will offer less suggestion, and suggest that corn liquor is the cause of it instead of good, pure milk, raw milk, if you will, I am sure that just as many people will agree it is the corn liquor instead of the raw milk.

I sincerely hope that the Public Health Service will not undertake to push this propaganda of undulant fever to an extreme limit. I think they are in a
very unfortunate position at present. If the evidence is sufficient to warrant it, no one would hail them in their effort to eradicate disease more than I will. But merely to point the finger of suspicion on milk, when we all know that the country needs to consume more milk and better milk, I think is very unfortunate. I hope the Public Health Service, before they intensify their undulant fever campaign against the raw milk supply, will get better evidence on which to make their statement. (Applause)

Dr. F. A. Mathews: I am at a loss to see how anyone can view the evidence we have today, incriminating the cow as a spreader of undulant fever to man, and say that we have nothing more than this finger of suspicion pointed at that dairy animal. To me, the thing is as conclusive as the finger of scorn that we point at the dog as being instrumental in the spread of rabies. Yet we do not hesitate to single out the dog, and incriminate him. Still we have people who say we should not incriminate the dairy cow on account of the damage to the dairy industry.

I wonder if those people who make these statements have ever had the opportunity to see a downright case of undulant fever, a case wherein the man is in bed and has been in bed for an indefinite period, and several months later is not giving much concern about whether he lives or not.

It brings to my mind an instance wherein the Public Health people were trying to get an ordinance in one city requiring the pasteurization of milk. One of the bitter fights against that ordinance was put up by an M.D. Within a very few months the man was in bed with undulant fever and has been in the hospital for a period of two years with undulant fever. There is no possible way that you can show that he contracted the infection other than from the dairy cow.

We must stop to remember that when we pasteurize we are not pasteurizing solely for the undulant fever, but we are pasteurizing for other diseases. When the Public Health Service has records like this, that not a single epidemic has been traceable to pasteurized milk, you must realize that they have some grounds for standing for a universal pasteurization.

Dr. Bahrtnsen: Mr. Chairman, the brother is evading the issue. We are sympathizing with every man who has undulant fever, at least I am. I know the balance of this audience sympathizes with a man who has undulant fever just as it does with any other sick man. You presume that the only and exclusive agent for producing undulant fever is the milk cow, and that is what I am objecting to. You do not have any such evidence. The statement you made just a while ago, that in no instance was the disease traced to pasteurized milk, is not so, because Dr. Fitch, just this morning, I think, told me they had three cases in Minnesota. One was traced to raw milk and the other two to pasteurized milk, and therefore nothing was said about it. Let us get the facts before us.

Dr. Hasseltine: I am not a member of this Association, but I would like to say a few words, inasmuch as it has been stated that the address which I gave yesterday, at the invitation of officers of this Association, was considered out of place. I am very sorry that I failed in giving you what you asked me to give.

Chairman Mercer: That is only my opinion. I am not speaking for the audience, I am speaking for myself. I thought that your allusion to the pasteurization of milk was out of place before this audience. That is my personal opinion.

Dr. Hasseltine: It was my understanding that the invitation was for a member of the United States Public Health Service to bring to this Association some of the work and ideas of another organization. That method is used in many organizations. I want to say, right now, that we have learned much from the veterinary profession and organizations throughout the country. In fact the time is coming when the veterinary profession and the health departments will work together. In fact, I expect to see the time in the near future when a veterinarian will be a member of every state health department.

As to the statement that has been made, that the health authorities are out of their jurisdiction when they attempt to do anything with milk, it is the function of a health department to prevent disease in man when the same is preventable. If milk is the factor which causes transmission of innumerable
cases of preventable infectious disease to man, I claim it is the right of the health department to have some voice in saying how that milk shall be produced and treated before it goes to the consumer.

It was stated that there is no evidence that would hold in court that milk carries undulant fever. In my address yesterday I conceded that point. How many people in this audience question the fact that typhoid fever may be carried through polluted water? Any of you? There is not a single case of undulant fever that has been traced directly to polluted water. On the other hand, we do isolate the Brucella organisms reasonably consistently from raw milk. We have never isolated the typhoid organism from water with any degree of consistency. I believe it has been reported once, in the entire history of the disease. If milk contains an organism which is easily demonstrable and water one which is not, which is the probable carrier of disease? We think that both have been sufficiently demonstrated by the methods which I outlined in my address yesterday.

I am sorry that Dr. Hardy, of Iowa, is not here. He has collected epidemiological evidence on some 300 cases. He has made bacteriological studies of the blood of a number of them—I do not know the total number—but he has isolated the Brucella organism, I think, from forty-two cases of undulant fever. Approximately two-thirds of those organisms have proven to be of the porcine strain of Brucella, the other third proved to be the bovine strain, or the true Bang bacillus.

In regard to the charge of Dr. Bahnsen that we lead our patients to give the answers which we want, I wish to point out that we are not trying to prove anything to the exclusion of other channels of infection. What I have been interested in is finding out how the thing is spread. It makes no difference to me—in fact, it would be much easier if I could prove that it was not spread by milk at all. But in order to guard against leading the patient, we take particular care in our questioning to leave it up to the patient to relate exactly as it occurs to him.

In the quotation which I made yesterday from the article of Schroeder and Cotton, it is impossible to exclude abortus organisms from the milk of cows by any procedure of inspection or cleanliness or sterilization. They are in the cow, and as the milk comes through that udder it is going to pick up some of them. Perhaps it is not continuously excreted, but it will be there, in a certain number of cows, all the time; in another portion, a part of the time, and in others perhaps not at all.

If the veterinary profession can give us clean cattle in every sense of the word, then pasteurization will not be essential. It is, however, an insurance against accidental contamination of the milk, after it has gone into the channels of trade, with carriers of infectious diseases. If you consider that proposition, whose business is it to look after that? Does it belong to the Department of Agriculture or the Department of Health? We claim that, inasmuch as after that it is a direct menace to human health, it belongs to the health officials.

I regret that my address of yesterday was not satisfactory. (Applause)

DR. BAHNSEN: Mr. Chairman, there is nothing to be regretted about it. The only way on earth that we will ever get anything straightened out is to discuss it. What I said I said without feeling and without offense to anyone, except to make my point clear. I am glad you brought the subject up. That is the only way it will ever be discussed. The trouble with many problems is that we evade them. We will never get anywhere by evading a subject. I am glad that it has been brought up, and I hope that the Public Health Service will avail itself of the cooperation of the various state institutions. I am sure that in the state of Georgia, the Veterinary Division will gladly cooperate with the Health Department and check up on every case of undulant fever they have, and trace the milk supply. We will be glad to cooperate with them. But the Public Health Service has not called on the Veterinary Division in Georgia to look into it and see what the source of the milk supply was, where it came from, whether the animals were reactors or not. I believe it is necessary
that they do that, in order to check up on this work properly, because I do believe that the veterinarians are better qualified to look after the veterinary end of it than the Public Health Service.

DR. HASSELTINE: May I state, Mr. Chairman, the health functions in any state, by law, come under the head of the state department of health. Whatever the Public Health Service does in any state is done with the permission of the state health officers.

I am sorry the United States is such a large field that I have not been able to visit all states. I did want to get to Georgia very recently to investigate one condition in that state where the field seemed promising. However, duties have called me to other states, and I have not been able to make it yet. I hope to be there some time in the near future. I shall take great pleasure in calling upon Dr. Bahnson at that time. (Applause)

PRESIDENT LAMB: I want to congratulate you, sir, upon the success of this meeting. You seem to have demonstrated that when you can get this bunch started on a subject, they talk right up. It is a little hard to get them started, but when they get started, there is plenty of subjects to be discussed and plenty of people to discuss them. I have no doubt that the experience of this morning will guide, in some degree, the Program Committee for next year, and perhaps more time can be allotted to a very valuable discussion of this character.

I do not want to interfere with the pleasure of the convention. If anyone has anything to say while Mr. Mercer is in the chair, I will be very glad indeed if he will say it.

CHAIRMAN MERCER: I just want to say one word. As far as my personal allusion is concerned, I have nothing against anyone who expresses his views upon any subject. I am a layman. As I said, I have listened to talks that went over my head, but I have quite pronounced convictions upon some things. With all due respect to the medical profession—I am under the care of one of them now, I believe in them—I want to leave this thought with the veterinarians, the sanitary officers and the M. D.'s that are here, that a certain kind of propaganda has gone out through the press of this country and has done more harm to our people than it has done good. It has restricted the use of milk—it has in my locality. Producers of milk in our country have come to me and stated that their milk consumption had fallen off, the people were not using so much milk. I think milk is one of the most wholesome foods that American people can use.

I believe that the medical profession should go on and investigate this proposition, that they should know just what to do. Then if they have anything to tell the sanitary officers of this country, as to what they authentically find out, we will listen. I want to refer to Dr. Hardy. I heard him discuss this question down in our state not long ago. He is no more positive, in his opinion, than the doctor who just spoke. That is my conviction on this subject. I meant to infringe on no one or personally grieve no one. I am in the habit of expressing my opinion, whether it amounts to anything or not. I believe that a whole day spent on things of this kind would be of great consequence. I should like to have heard more about the control of rabies in the various states and how you got along with it, and what is the best thing to do. It is quite troublesome in our state. It is more fatal to the lives of our people than undulant fever, I am sure.

I thank you very much for the meeting this morning. (Applause)

... President Lamb resumed the chair...

PRESIDENT LAMB: We will now continue with the regular program as outlined, and consider swine diseases. The first paper on the program is "Pulmonary Edema of Swine," by Drs. Charles Murray and H. E. Biester.

... Dr. Murray read the paper...
PULMONARY EDEMA OF SWINE

By Chas. Murray and H. E. Biester

Department of Veterinary Investigation,
Iowa State College, Ames, Iowa

In a series of studies made in 1918-19 upon swine suffering from broncho-pneumonia, one of the most frequently observed changes was the edema of the lungs. So common was this that we came to look upon it as a more or less characteristic lesion. Observations of the disease the past few years have not disclosed the edema as being so commonly associated with the condition. In this respect there is similarity to observations made by those investigating human influenza during the years of its widespread occurrence, in that in 1919 the “water-logged” lungs were rarely encountered, whereas in 1918 these were looked upon as among the most characteristic lesions. There has recently been reported by various observers, Ray, Kinsley and others a specific pulmonary edema of both cattle and swine, not associated with the condition mentioned above (broncho-pneumonia). Unlike the latter, which is characterized by sudden onset and which sweeps through the herd very quickly and with a low mortality, pulmonary edema rarely attacks large numbers at a time but only a few individuals with high mortality. One western and one eastern serum company handling large numbers of susceptible pigs and immune hogs report only occasional deaths of either class showing edema of the lungs. On the other hand, some practitioners report the condition as of sufficiently frequent occurrence to warrant careful consideration. We are not in position at this time either to affirm or dispute the contention that a specific pulmonary edema of swine exists but we do feel that the presentation of certain facts pertinent to the question is not out of order.

Pulmonary edema consists of the presence of a serous fluid with varying numbers of red and white cells and albumin in the alveoli of the lung. When the process is produced by a factor operating in a mild manner, the fluid present in the alveoli contains a small quantity of albumin, containing only a small number of isolated red and white cells with a few detached alveolar cells. In this case the fluid is termed a transudate and the process is classified as a non-inflammatory edema. In the more
acute or severe type of edema the fluid present in the alveoli is richer in albumin and coagulates readily. It also contains more leucocytes and red cells and there is more extensive epithelial desquamation in the alveoli. This is the form which accompanies pneumonia. When this type of exudate coagulates, it is known as the hepatization stage of pneumonia.

**THE MECHANISM OF PULMONARY EDEMA**

To appreciate more fully the significance of the term pulmonary edema, one must have in mind the essentials of the mechanism by which this picture is produced. The literature dealing with the causes and production of edema is extensive, the subject having been approached by pathologists, physiologists, chemists and workers in related fields. The increased permeability of the capillaries of the lung is considered one of the essentials in transudation or exudation into the alveoli. An alteration of the endothelium is demonstrated in the presence of edema. With the rapid strides made in the field of colloidal chemistry, another mechanism is looked upon as important in the production of edema, i.e., a disturbance of the blood colloids, proper concentration being necessary to retain or hold back the water in the vessels. Increased blood pressure is not stressed as formerly. Later experimental work has shown that pulmonary edema takes place before the blood pressure of the lungs rises, stagnation or stasis resulting in anoxemia with the formation of products acting upon the endothelium to bring about the escape of blood fluids.

Some of the causes which operate this mechanism in the production of pulmonary edema not accompanied by pneumonia are:

1. Incoordination of the work of the right and left ventricles
2. Valvular disorders
3. Nephritis and hepatitis
4. Toxins
5. Gases acting upon the lungs (may terminate in pneumonia)
6. Experimental intravenous injections with certain quinin derivatives, etc.

It will be noted that primary pulmonary bacterial infections are not included in the list.

In controlled experimental cases of non-infectious pulmonary edema injuries to the endothelial cells can be demonstrated. Any of the above factors which may bring a toxin or irritant in contact with the intimal cells of the vessels can produce the injury
PULMONARY EDEMA OF SWINE

which results in the escape of serum. A lack of oxygen as a result of stasis can also operate to bring this about. Some of the above factors acting on the blood colloids may likewise operate to permit a passage of the fluid elements of the blood out of the vessels. Passive congestion and hypostatic congestion predispose to infection and may terminate in pneumonia.

In animals that have been exposed to phosgene, varying grades of pulmonary edema are produced. Some animals died in from 10 to 15 hours, others that recovered from the effects of the gas and were then sacrificed often showed a more extensive edema than those which succumbed. Monkeys and guinea pigs succumbed more rapidly than dogs and goats, although the first-named presented more pulmonary edema. The evidence in this type of edema indicated that the edema in itself is not the cause of death but is merely a concomitant manifestation of a more important basic cause.

Edema Associated with Pneumonia

When pulmonary changes due to bacterial agents are considered, we find an entirely different picture from that produced by the first group of factors. In the pulmonary infections edema is nearly always associated with pneumonia, i.e., stages that have progressed beyond congestion and edema. The first stage of lobar pneumonia is characterized by an engorgement of the capillaries adjacent to the alveolar walls and exudation of serum together with cellular elements into the alveoli. When this exudate undergoes organization it leads to the stages of red and gray hepatization respectively. The first stage is rarely seen alone at autopsy except at the edges of the advancing consolidation, in fact some of the characteristics of this stage are to some extent constructed from the known course of inflammation. In some outbreaks of human influenza the edematous process may appear very acute and involve much of the non-consolidated areas, although death is produced by a more basic cause operating also on other vital organs. To assign the edema as the cause of death would be like considering the hemorrhages of hemorrhagic septicemia or the petechiae in hog cholera as the cause in these diseases, rather than as an example of a manifestation of an undemonstrated deeper-seated reaction acting upon the body and producing death.

The organism assigned as the probable cause of pulmonary edema in both calves and swine is an unidentified diphtheroid,
or corynebacterium. The large group of bacteria to which this organism undoubtedly belongs show as their chief characteristics a morphological similarity to the diphtheria bacillus in being pleomorphic, gram-positive, non-motile, non-spore-forming and often showing metachromatic granules under the proper staining methods. They are very numerous and have been isolated from many different sources in nature and in connection with the human and animal bodies. Bloomfield and Fox, Zinsser and others have isolated organisms of this or similar type from the skin and lymph-nodes of healthy and diseased people and from ascitic fluid in varying conditions and from supposedly sterile tissues. They are said to be commonly present in the nasal mucus and in the throat Hiss and Zinsser\(^3\) class them as a heterogenous group, held together by morphological and superficial cultural similarity and largely consisting of saprophytic and probably harmless parasites on the human and animal body. These authors further state that the organisms of this group are so ubiquitous that any association of them with specific disease must be very conservatively approached. Negri and Mieremet\(^4\) and Bunting and Yates\(^5\) have reported the isolation of diphtheroid bacilli from several cases of Hodgkin’s disease but there is nothing to be found in the literature indicating that this condition or any other has ever been produced by injection of the organisms. We are likewise unable to find in the literature where the condition of pulmonary edema has been induced by exposing animals to the organisms. That such organisms may be found in both healthy and diseased lungs is to be expected. One investigator who has been studying pulmonary diseases of swine for more than a year reports (unpublished) the isolation of diphtheroids from both healthy and pathologic lungs as of very common occurrence. In this connection it may be of interest to cite some experimental work done by F. S. Jones,\(^6\) of the Rockefeller Institute, to trace the source of microorganisms in the lungs of normal animals. While the diphtheroids are not named specifically by him as being present, yet from their ubiquitous and saprophytic nature they might easily be. In his experiments he showed that the lungs of the calf, rabbit, guinea pig, white rat and white mouse were readily invaded by microorganisms, the most frequent types observed being streptothrix, molds and bacteria of the \(B.\ subtilis\) type. These forms, he holds, originate in certain dry foodstuffs such as hay and straw. By withholding or moistening the hay or straw the number of organisms found in
the lungs of fed animals is diminished. Mice, whose lungs under usual conditions contain few microorganisms, when supplied with dusty foodstuffs show an increasing number of positive cultures comparable to large animals. Guinea pigs fed in the usual manner showed 91 per cent positive cultures from lungs, in contrast to 29 per cent when fed washed hay, and 26 per cent when fed green grass or cabbage. Three mice fed under dust-free conditions showed all negative cultures, whereas four fed in pens with straw used as litter showed all positive cultures. Similar results may well be anticipated with animals such as swine and cattle fed under usual conditions and the probability of organisms of the diphtheroid group being present in the lungs is significant. Mere presence cannot be accepted as evidence of infectivity, but exposure experiments must be conducted with positive effect before we are warranted in assigning the diphtheroids as an etiological factor. Our evidence incriminating this type of organism as productive of an edema of the lungs is negative. A few swine have been exposed by injecting large quantities of two varieties of diphtheroids into the nostrils but no symptoms of lung affection have been apparent and temperature reactions have not occurred.

In recent cultural and morphologic studies of organisms being used by laboratories for the preparation of specific bacterins for pulmonary edema, we have found but two of ten samples showing the characteristics that would certainly classify them as diphtheroids. Neither of these has shown pathogenicity for swine. We do not want to be misunderstood as claiming that a specific pulmonary edema of swine does not exist. Our studies up to the present are too incomplete to warrant any statement either pro or con. We do feel, however, that until conclusive evidence is accumulated, pointing to a specific etiology, it would be unwise to hold forth any encouragement for control of the disease by the use of immunizing agents.

REFERENCES

PRESIDENT LAMB: We will proceed to the report of the Committee on Swine Diseases, by Dr. E. A. Cahill. (Applause)

.... Dr. Cahill read the report. ....
REPORT OF COMMITTEE ON SWINE DISEASES

Dr. E. A. Cahill, Chairman, Chicago, Ill.

Dr. M. Dorset, Washington, D. C.  Dr. Charles Murray, Ames, Iowa.
Dr. C. H. Hays, Lincoln, Nebr.  Dr. A. T. Kinsley, Kansas City, Mo.

The Committee on Swine Diseases is not aware of any unusual condition which should be reported to the Association at this time. All of the information available indicates that hog cholera has not been more prevalent than in 1928 and that so-called "flu" has probably occasioned less loss than during the two previous years. Without more definite statistical data than is available to the Committee, it is difficult to determine definitely whether or not necrotic enteritis is on the increase but observation indicates that necrotic enteritis and parasitic infestations are constantly becoming more serious. If this be true, then the need for more and better sanitary measures is quite apparent and it is the belief of your committee that sanitary measures to minimize the losses from these conditions should constitute a major project of all the live stock sanitary authorities in the Corn Belt.

In Nebraska and in some other states scabies, or mange, is becoming increasingly prevalent and should receive the profound consideration of practitioners and sanitary authorities before it becomes more serious. The handling of this disease apparently requires a method of sanitation different from the McLean County system.

In some sections of the country an edematous condition of the lungs is being reported as quite prevalent. Some observers believe it to be a specific entity while others are of the opinion that it is merely an unusual manifestation of some of the previously known diseases. It is hoped that future research will clarify our knowledge of this condition.

Post-vaccination trouble continues to be a matter of serious importance. As far as is now known, vaccination offers the only practical means of controlling hog cholera and if severe financial losses are to be prevented, it is necessary that vaccination be regularly practiced on a large scale. To accomplish this it is essential that results following vaccination be uniformly satisfactory, since otherwise the confidence of the public will be shaken, vaccination will be decreased and cholera losses increased. Unfortunately some vaccinations are followed by undesirable results and this fact is now engaging the attention of the lay press as well as the attention of those actually engaged in sanitary control measures. It is your Committee's belief that most post-vaccination trouble is due to factors other than the products used and that the seriousness of this entire matter justifies all of the research and investigation which can possibly be undertaken.

The oft-mentioned failure of the public to profit by experience is again becoming apparent. It was believed that following the cholera outbreak in 1926, vaccination would henceforth be more generally practiced. However, since 1926 the incidence of cholera has gradually decreased and many individuals have developed a sense of false security and demonstrated a marked tendency to forget the experiences of 1926. During 1929 the corn-hog ratio has been unsatisfactory to feeders and hog prices have fallen very materially. As a result of the factors above mentioned the vaccination of swine since September has been much lighter than for several years and the number of cholera-susceptible swine in the country is now very great. Unless this condition is changed by increased vaccination before next spring, the percentage of susceptible swine will probably be as great as it was prior to the 1926 outbreak and the possibility of a serious epizootic of cholera will be correspondingly increased. Your Committee believes that all live stock sanitary authorities should be cognizant of the impending danger and promote publicity measures to warn the public that such dangers can only be prevented by systematic spring and fall vaccination regardless of other factors.

In order that vaccination may be more universally practiced and followed by results as uniformly satisfactory as possible, your Committee recommends:
1. That veterinarians make an extreme effort to determine that animals to be vaccinated have not been subjected to devitalizing conditions.
2. That if the simultaneous treatment is to be administered to swine which are not in perfect health, the owner be informed that some post-vaccination trouble will invariably occur and that vaccination be postponed until corrective measures have been applied.
3. That those in position to do so be urged to make extensive investigations into the cause and post-vaccination troubles and their prevention.
4. That research workers devote more study to hog cholera virus, in order that its composition and nature may be better understood.

DR. CAHILL: Mr. President, I move the adoption of the report.

. . . The motion was regularly seconded, put to a vote and carried.

PRESIDENT LAMB: That concludes the division of swine diseases. Now we come to meat and milk hygiene. The first paper is “Canadian Meat Inspection Service,” by Dr. George Hilton, Veterinary Director General, Department of Agriculture, Ottawa, Ont., Canada.

. . . Dr. Hilton read his paper.

CANADIAN MEAT INSPECTION

By GEORGE HILTON, Ottawa, Canada

Veterinary Director General

It has been said that “One man’s meat is another man’s poison, and at any rate, is his strong aversion.” There is much truth in this statement when applied universally, as while similar varieties of meats are in general favor by the two nations on this continent, they are prone to look with disgust at the consumption of other varieties, by some of the other nations.

Salted dried rats, pickled and roasted monkeys, and pickled spiced elephants’ toes are a few of the acknowledged delicacies of some countries which we do not fancy. The flesh of the horse is a common meat diet of some nations, but it has not taken, nor is it likely to take, the place of beef on this continent. We are quite satisfied that our common meat supply shall consist of the flesh of our domestic cattle, sheep, swine and poultry, with a variety of game birds and venison.

While the taste for, and choice of, meat dietaries depends largely upon the point of view, and may often be acquired, it matters little to the welfare of a nation whether the popular meat supply consists of the flesh of the ox, or the flesh of the monkey, as long as the meat is sound, wholesome and nutritious, and free from anything of a noxious nature.

In a matter of such vital moment to the health and well being of the public, it is the sovereign right of every citizen, not alone for his own sake, but on behalf of those of tenderer years, who
are dependent upon his maturer judgment and closer discrimi-
nation, to demand a safe and wholesome meat supply.

The question of the sanitary supervision of the traffic in meat
for human consumption is extremely ancient, as it has been shown
in the traditions of the oldest civilized nations. Wonderful
advances have been made in modern hygiene, which its founder,
Edmund Alexander Parkes, defined many years ago, as "aiming
at rendering growth more perfect, decay less rapid, life more
vigorous, death more remote."

There has probably been no topic engaging the serious atten-
tion of sanitarians the civilized world over, during the past decade,
more than that of meat and food inspection. The sole purpose of
this interest and attention has been the securing, for the people,
of a sound nutritive and wholesome food supply, which figures so
largely in the health, the development and the very existence of
the race.

PROGRESS RETARDED BY IGNORANCE

While progress has undoubtedly been made, it has been
retarded by the gross ignorance which prevails amongst the
people generally, with regard to the simple laws of self-preserva-
and protection, as applied to food. There is probably no
other question of social economy, upon which the general public
is more ignorant, or views with less concern, than that of the
wholesomeness, or otherwise, of the flesh they consume. On
that ground alone, it is incumbent upon sanitary authorities to
guard them against abuse and injury.

With the progress of civilization, competition in trade has
increased enormously, not only between the people in a country,
but also between the nations of the world. Remarkable dis-
coversies have resulted in extraordinary methods, by which the
crudest, and often offensive, products have been changed, to
please the eye and tickle the palate.

The strife for supremacy in commerce is so great that the more
important problem of public health is too frequently overlooked
in the ceaseless activities of our commercial life. It should be
the duty of everyone to make common cause against any eradi-
cable agent or factor, that may be responsible for imperilling the
health, and sometimes the life, of the citizen.

While, in ancient times, religious principles governed the selec-
tion of meats, it is surprising to find that, in modern times, the
conservation of a nation's foreign markets has been the stimu-
lating factor in the enactment of laws for compulsory meat inspection. It is, unfortunately, the natural sequence to the persistent demand of commerce, and the lethargy of the common people, who have been satisfied, to pay the cost of modern scientific meat inspection for products destined to other countries, without insisting upon the same careful inspection of meats prepared for home consumption.

It is a remarkable fact that it has always been difficult to get the people—those who are to be the real beneficiaries of a safe food supply—to become sufficiently interested in that problem, although it is of such vital import to their own and their families' health and comfort. While meats which have undergone inspection for export trade are also available for home consumption, non-inspected meats, even in this enlightened age, are not only being constantly exposed for sale, but are being commonly purchased and consumed.

Municipal Abattoirs Desirable

It should be a matter of common concern that no meat is permitted to be offered for sale in a community that has not passed an efficient system of inspection, in a centralized municipal slaughter-house or plant. There can be little doubt that the only reliable system of inspection is that carried on in the public abattoir under the supervision of the properly trained inspector. The private slaughter-house should never have been permitted to exist; many of them are an abomination and a disgrace to civilization. I am convinced that there will never be a thoroughly reliable protection to the public from unsound meat, until all food animals are slaughtered and their carcasses prepared in public abattoirs under proper supervision.

Those who have had experience with the expert methods of the butcher, in dressing and trimming a carcass to remove unnatural conditions, realize the great importance of maintaining a close supervision over his work from the time of making the antemortem inspection, until the carcass is hung up for removal to the cooler.

An animal whose flesh is intended for human consumption should be inspected, while still alive, by a graduate of a reputable veterinary school. Antemortem examination will often reveal conditions which would render the animal unfit to be slaughtered for human food, or suggest a closer investigation upon post-mortem inspection.
The Canadian Federal Meat Inspection Service was established twenty-two years ago, under the able direction of the late Dr. J. G. Rutherford, who, later, I believe, became an esteemed member of this organization.

In the preparation of a suitable act to govern this inspection, the legal authorities ruled that as the Act of Confederation reserved certain definite powers to provincial legislatures and other smaller local authorities, the federal act must necessarily be limited in its scope. This act was entitled the Meat and Canned Foods Act, and it was approved by the Dominion Parliament, and added to the federal statutes in 1907. With its supporting regulations, it applies to all interprovincial and export shipments of meat and meat food products, as well as to those which may be imported.

The slaughter of animals, the preparation and handling of meats and meat food products, in all abattoirs engaged in interprovincial and export trade in Canada, have, since that time, been conducted under the constant supervision of full-time, salaried veterinary officers located in the plants, and a system of ante- and postmortem inspection has been maintained.

**The Object of Meat Inspection**

The object of this service is to prevent the export and interprovincial shipment of diseased or otherwise dangerous meats, to ensure that the preparation and handling of meats and meat food products conform with modern sanitary views, to prevent the use of harmful dyes, preservatives and chemicals, to enforce correct and honest labelling, and to ensure that the meat and meat food products are sound, wholesome and fit for human consumption. No meat or meat food products, can be shipped out of a province, nor out of the Dominion, unless and until the requirements of the Act and all regulations have been fully complied with.

All establishments in the Dominion, engaged in the export of meats and meat food products, irrespective as to whether this trade constitutes the major or minor portion of their business, are subject to the operations of this Act, and must come under federal inspection or discontinue in this trade.

Inspection is not granted to any establishment unless the plant meets the requirements of sanitation in regard to construction, equipment and maintenance. Non-absorbent materials must, as far as possible, be used in the construction of the plant; the
light and ventilation must be adequate; drainage and plumbing systems must be modern and satisfactory. Sanitary dressing-rooms, toilets and lavatories must be provided. The water supply must be free from contamination, and to ensure its safety it is systematically tested.

The plant must also provide satisfactory facilities to handle edible and inedible products in entirely separate compartments.

When inspection is granted, the entire premises, including the yards, pens and stables, are placed under the constant supervision of federal officers.

A suitable number of veterinary officers, with lay assistants to supervise operations, are placed permanently in the plant, and the work of inspection commences with the live animal when it enters the yards of the establishment. Metal tags are inserted in the ears of the animals showing symptoms of disease, and they are then segregated, and held for further examination. The postmortem inspection of all animals is thorough, and includes the skin, flesh, glands and organs.

Carcasses showing abnormal conditions, including the head and viscera, are promptly marked for identification, and are then removed to a special compartment, where they are carefully reinspected, and a final decision reached, regarding their fitness for food purposes. The condemned carcasses are placed in special tanks, and rendered into fertilizer products by exposure to high-pressure heat. These tanks are sealed with the Government seal, which may be broken only by a Government employe.

"Canada Approved"

Carcasses passing inspection are stamped with the Canadian Government Inspection Legend, "Canada Approved," and are then removed to the coolers, while the viscera are transferred to the offal department, where the fats are separated, and the organs cleansed and prepared for sale as such, or undergo processing and cure. Close supervision is maintained throughout these plants, and nothing is permitted to leave or enter them, without the knowledge and consent of an inspector.

In addition to the marking, "Canada Approved," all export shipments are accompanied by a certificate signed by a salaried veterinary officer, to the effect that the meats or meat food products are wholesome and fit for food. The importation of meats and meat food products into the Dominion is also limited to those accompanied by similar certificates, from countries
maintaining a meat inspection service of a standard equal to that enforced in Canada.

The Chief of the Meat and Canned Foods Division of the Health of Animals Branch of the Federal Department of Agriculture is in charge of this work, and a supervising veterinary officer, with an adequate staff of veterinary and lay inspectors, is located in each plant.

A directing veterinary officer, with a central office and clerical staff, is located in each large packing center where several abattoirs are in operation, and travelling veterinary officers make occasional visits to each packing-plant, to maintain uniformity in the interpretation of the regulations, and in the methods of inspection.

We have in this way been able not only to maintain constant and complete supervision over the operations of all plants engaged in interprovincial and export trade, but also to render a uniform service, without an unreasonable variation, in the rendering of judgment upon the many varied conditions found in the comprehensive work of meat inspection.

The Packer's Attitude

The Canadian packer differs very little from the packer of other countries, and he naturally considers that he understands his own business. He consequently did not at first take kindly to the making of the necessary changes to meet the provisions of the Act and its regulations. He did not favor the elimination of certain materials in certain products, nor the expenditure involved in the substitution of modern sanitary equipment for those of older design. His attitude was undoubtedly due to a lack of knowledge of the benefits which would ultimately accrue from the marketing of officially certified sound wholesome products.

It was not long before the packer commenced to realize that the meat inspection service was putting his business on a higher moral plane and, as a result, his confidence was secured.

A mutual understanding soon followed between the managements of our abattoirs and our inspection staff, concerning the essential requirements for the production of sound wholesome meats, which has developed into a cooperative procedure.

The Canadian Federal Meat Inspection Service has, after a period of twenty-two years, become well established, and generally approved, but it unfortunately applies to only approxi-
approximately 50 per cent of the animals slaughtered for food purposes in the Dominion. We are anxious that the same system of inspection should also apply to our entire domestic trade.

While this is a problem which comes within the purview of our provincial and local authorities, it is, as a matter of fact, the people's problem. A persistent demand from the common people for such an inspection could not long be disregarded by the authorities, whose duty it is to serve them.

Many local authorities have passed ordinances governing the inspection of meats in their communities, but few of them have eliminated the private slaughter-house and the inspection in many is limited to the dressed carcass or its portions.

We do not discourage any form of inspection in the hope that it may lead to better and improved methods, but we are firmly convinced that adequate protection of the general public, from the ill effects of diseased, unsound and unwholesome meats, can be obtained only by limiting the slaughter of all food animals to centralized public slaughter-houses, where a thorough and reliable inspection can be made, both before and after slaughter.

President Lamb: We will proceed to the report of the Committee on Meat and Milk Hygiene, by Dr. J. P. Iverson, of Sacramento, California. Is he in the room or is anyone representing him? Evidently not.

It is very evident that a program committee, in drawing up a program for a three-day session, cannot, in the nature of things, include everything that might interest everyone in the Association. I am going to request Mr. Mercer to take the chair again and continue his open-session program, and I urge that anyone who has anything to say relating to any matter whatever, whether it has been on the program or not, make a talk.

Mr. Mercer will you kindly take the chair again.

Mr. Mercer took the chair.

Chairman Mercer: I have not been thinking up anything to arouse contention. As suggested by the President, it is not out of place for you to discuss any subject that you might have on your mind.

I would like to hear from some of you state officials as to how you control rabies. We have quite a little difficulty in our state. I meant to say, when I was on my feet before, that it would be much more easily controlled by a vaccine or something of that kind than by just a general quarantine, but I have not had the success with rabies vaccine that my friend from Texas has.

We have tried to demonstrate its merits quite thoroughly.

We might have some discussion on the disposition of hogs out of clean areas. I know there are several fellows interested in that. I want to say that the method adopted out our way has been of tremendous benefit, and that is the tattooing of hogs to our major markets. It has given us an opportunity to go back to the farms, by getting that record. I would like to hear from you along that line especially, because some of the packers have stopped paying the premium. It might be the means of encouraging them to get back into the game or adopt some other plan.

President Lamb, I am afraid I am not going to have any success here unless I can say something to make somebody mad, and I do not know what to say. If none of you want to say anything, I am going to turn this meeting back to the President.

Mr. President, they do not seem to want to talk.

President Lamb resumed the chair.
COMMITTEE ON UNIFICATION OF LAWS

PRESIDENT LAMB: I am disappointed to think that when given an opportunity to discuss anything on your mind, you do not take advantage of it. I had planned to suggest to a future program committee that they devote at least one-half day to an open discussion of anything that anybody wanted to discuss, but evidently they do not care to do so.

We have nothing special on our program now, but Dr. Houck, who is chairman of the Committee on Unification of Laws and Regulations, tells me he is obliged to leave tomorrow and cannot wait until his report would be received in the usual order. I am going to ask Dr. Houck to present the report of the Committee on Unification of Laws and Regulations.

DR. U. G. HOUCK: I am sure that the members of this Association were impressed with the forceful remarks of Dr. Fitch, in presenting the very good report on abortion disease yesterday. I know that the members of the Committee on Unification of Laws, and Regulations were deeply impressed and gratified with what he said in regard not only to the desirability but the necessity of uniformity of regulations as a factor in the control of contagious abortion. What applies to the control of contagious abortion applies relatively to other contagious and infectious diseases of animals as far as uniformity of regulations is concerned.

That report of the Committee on Abortion expressed about all there is to express in regard to uniformity of regulations; that is an imperative necessity in order to bring about the best results in the control of diseases and facilities in handling animals in interstate trade.

It is realized that live stock sanitary authorities have the power to draft and enforce such regulations as they deem necessary to meet their own conditions. You will see by a review of the reports of the various committees on unification of laws and regulations that all the various phases of live stock transportation have been covered and are of record in those reports.

It is realized also that state veterinarians cannot always draw regulations as they would desire to draw them. Live stock sanitary boards, or many members of live stock sanitary boards, have their own views in regard to what regulations should control their live stock industry, and they insist on carrying out their views to the letter in drawing their regulations.

Frequently there are changes in the members of live stock boards and also state veterinarians. Under these conditions we cannot expect to make very rapid progress in bringing about the uniformity that is desired and which would be beneficial to all concerned. I believe, however, that we should keep bringing the matter before the Association and before the members of live stock sanitary boards in as forceful a manner as we can, with the hope that the influence of this Association will be radiated and felt more and more.

The report of your Committee on Unification of Laws and Regulations really is supplementary to the report that was presented yesterday on abortion disease. I will now read the report.

. . . Dr. Houck read the report. . . . (Applause)

REPORT OF COMMITTEE ON UNIFICATION OF LAWS AND REGULATIONS

DR. U. G. HOUCK, Chairman, Washington, D. C.

Dr. Wm. Moore, Raleigh, N. C. Dr. E. T. Faulder, Albany, N. Y.
Mr. M. G. Thornburg, Des Moines, Iowa.

A review of the reports of the Committee on Interstate Shipment of Swine for the years 1920, '21, '22, '23 and '24, and of the Committee on Unification of Laws and Regulations each year from 1925 to the present time, shows that recommendations have been made covering all of the important phases of inter- and intrastate movement of domestic animals. The reports were made by the committees and approved by the Association with the view of establishing principles for the guidance of live stock sanitary authorities in the promulgation of their live stock traffic regulations. Your present committee has little to add to the recommendations already of record. The hope has been
shared by all who are interested in live stock matters that the attitude of this representative body should be reflected in a favorable trend toward uniformity of state laws, and especially regulations affecting the movement of live stock. There has been improvement, but it has not been so rapid as was hoped or so general as might be expected.

Livestock sanitary officials, transportation companies, and shippers of live stock continue to call attention to the lack of uniformity in interstate regulations and they complain of the resulting confusion.

This Committee urges more uniformity than now exists in state regulations governing the interstate movement of live stock, and that regulations be written in plain language that can be understood by laymen. It has been stated in various quarters that the regulations of some states are more confusing than the laws upon which they are based. Recently attention has been called to the lack of uniformity in new regulations relative to contagious abortion.

While it is generally conceded that the authorities of each and every state may promulgate such regulations as they deem advisable, your Committee in the interest of uniformity recommends that the authorities of a state confer with the authorities of other interested states through personal contacts or by correspondence, before issuing new regulations and before making any drastic changes in existing regulations. Such procedures undoubtedly would contribute to harmonious official relations and lead to more uniformity in state regulations.

In this connection the attention of the Association is invited to a recommendation made by the 1925 Committee on Unification of Laws and Regulations, in effect that regional committees be appointed by this Association to meet at their convenience for the purpose of discussing regulations and other matters of mutual interest. While the report of that Committee was approved by the Association, nothing further has been done in regard to the recommendation.

Dr. Butler read the report. May I have a word? You can see what Dr. Hall thinks of all the work this committee has been doing for a number of years. I agree with him to quite a considerable extent. I do not go so far as to say that no further committee should be appointed, because I do not believe that way. I do believe a committee should be appointed, but I also believe that that committee should bring in a very comprehensive report, and then the Association should discuss it. If it is adopted, the Association should remember that they have adopted certain recommendations. I know the past year I had rather an embarrassing situation presented to me. This Association recommended that certain definite action be taken, and I took it up with our Senator, had a joint resolution introduced in the Senate of the United States, and this Association forgot about it; they forgot that they had ever passed such a resolution. You know when we get to be quite a large association we do pass things by, but this is an association of regulatory officers. We come here to discuss our problems, to find out what the other man is doing, what the other states are doing, and what the research workers have to offer us in the way of new methods for controlling and eradicating disease. For us to sit here and vote "aye" on a committee report presented to us and then forget all about it is not the right way of doing
business. I do hope that this Association will spend more time on discussion, and that you will thrash out your problems to some conclusion; voice your sentiments. If you do not believe in it, say so; fight it out. But do not just simply sit idly by and let the other fellow vote "aye" and then go home and pay no more attention to it.

I do not know how to present that report to you, Mr. President. My personal view is that you incorporate in that report the entire report, the report made by Dr. Wilson and also the added report by Dr. Marsteller and myself. (Applause)

PRESIDENT LAMB: Gentlemen, we seem to have a conflict or at least a disagreement. As I read this, the first item on the report of the Committee on Parasitic Diseases is:

"1. The subject of parasitic disease of live stock is receiving an increasing amount of attention over the United States."

It appears that all concur in section 1.

"2. Parasitic diseases are spreading and increasing in intensity for the most part and much work must be done on these diseases if we are to combat and control them successfully."

I understand that that is concurred in by each member of the Committee.

"3. Your Committee on Parasitic Diseases has made a number of reports incorporating constructive recommendations for the past few years, but these suggestions have not been discussed or acted on at any time, and it does not appear to serve any useful purpose to repeat these recommendations at this time or to make others.

"4. In view of the lack of interest in this subject on the part of the Association, your committee does not believe that the subject of parasitic diseases of live stock should be allowed to take up the time of the Association or of the members of a committee, and, therefore, recommends that no such committee on parasitic diseases be appointed for the ensuing year or until the Association may at some future date become interested in the subject."

That report is signed by Dr. Maurice C. Hall. Dr. Wilson, in his minority report, says:

"The above report is concurred in, with the exception that it is suggested that no committee on parasitic diseases be appointed in case the Association cannot and does not recognize the Committee's recommendations."

Here is another report, signed by Dr. Butler and Dr. Marsteller, suggesting that paragraphs 3 and 4, just read, read as follows:

"3. Your Committee on Parasitic Diseases for the past few years has made a number of reports incorporating constructive recommendations. These suggestions have not been as thoroughly discussed as the Committee feels they should have been.

"4. We recommend that a committee be continued and that this committee be instructed to bring to the attention of the Association each year the most important developments in regard to parasitic diseases, especially in regard to control, and that the Association be asked to discuss the report and act on it. The habitual reference to a report to the Executive Committee with no resultant attention to the subject is regarded by your committee as an inadequate and unprofitable procedure."

DR. BUTLER: I move that paragraphs 1 and 2 of the report be adopted and also paragraphs 3 and 4, signed by Dr. Marsteller and Dr. Butler, as the Committee's report.

MR. MERCER: I move that the Committee's report be adopted as amended by Dr. Butler and Dr. Marsteller, who signed the recommendations to the report of the Committee. That will adopt all of the report including the first two paragraphs with the amendment as suggested by these two other members.

PRESIDENT LAMB: Will you suggest that the Association vote separately on each one of these amendments, paragraphs 3 and 4?
MR. MERCER: I do not suggest it, but I suggest that the amendments as offered by Dr. Butler be adopted as a part of this report, and that amends the entire report.

The motion was regularly seconded.

PRESIDENT LAMB: In order that the Association may understand what they are voting upon, with your permission I will read the report as it would appear with the amendment of Dr. Butler and Dr. Marsteller.

President Lamb read the amended report.

REPORT OF COMMITTEE ON PARASITIC DISEASES

DR. MAURICE C. HALL, Chairman, Washington, D. C.

Dr. W. J. Butler, Helena, Mont. Dr. R. P. Marsteller, College Station, Texas
Dr. H. D. Port, Cheyenne, Wyo. Dr. H. A. Wilson, Jefferson City, Mo.

Your Committee wishes to report briefly as follows:

1. The subject of parasitic diseases of live stock is receiving an increasing amount of attention over the United States.
2. Parasitic diseases are spreading and increasing in intensity for the most part and much work must be done on these diseases if we are to combat and control them successfully.
3. Your Committee on Parasitic Diseases for the past few years has made a number of reports incorporating constructive recommendations. These suggestions have not been as thoroughly discussed as the Committee feels they should have been.
4. We recommend that a committee be continued and that this Committee be instructed to bring to the attention of the Association each year the most important developments in regard to parasitic diseases, especially in regard to control, and that the Association be asked to discuss the report and act on it. The habitual reference of a report to the Executive Committee with no resultant attention to the subject is regarded by your Committee as an inadequate and unprofitable procedure.

It has been regularly moved and seconded that the report of the Committee, as amended, be adopted. Are there any remarks? If not, all in favor of the report as amended will please say "aye"; contrary, "no." The motion is carried, and the report as amended is accepted.

DR. CARY: Mr. Chairman, I move that the Committee on Legislation be directed, not asked, to ask for more appropriations for the special work of investigation and research on animal parasites for the Bureau of Animal Industry, and that the Bureau of Animal Industry put more men and money into this work where it is needed, and let them decide that. I make this motion to act now.

The motion was seconded by Dr. Bahnsen and carried.

The meeting adjourned at 11:45 a.m.

ADJOURNMENT

THURSDAY AFTERNOON, DECEMBER 5, 1929

The fourth session convened at 1:40 p.m., President Lamb presiding.

PRESIDENT LAMB: Gentlemen, we are starting in on a rather full program this afternoon, on a subject that is, of course, of great interest to all of us. I hope that a free discussion will be had upon all these papers.

The first is by Dr. A. E. Wight, Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, Washington, D. C., on "Present Status of National Cooperative Tuberculosis Eradication Campaign." (Applause)

Dr. Wight: In the beginning I will say that this paper will need no special discussion as it is more or less a survey of what has been done the last twelve months.

Dr. Wight read his paper. (Applause)
PRESENT STATUS OF NATIONAL COOPERATIVE TUBERCULOSIS ERADICATION CAMPAIGN

By A. E. WIGHT, Washington, D. C.

Chief, Tuberculosis Eradication Division, U. S. Bureau of Animal Industry

The status of the cooperative tuberculosis eradication campaign that has been so successfully conducted throughout the United States during the past twelve years continues, I am pleased to report, to be most encouraging. The campaign has been an active one in many respects during the past twelve months, and it will be the purpose of this paper to cite briefly some of the important features of interest to this organization and to the livestock industry at large. It was said in the beginning of the cooperative work that was established under a plan outlined by this association, that tuberculosis among livestock could be eradicated, and up to the present we have every reason to believe that such a condition can practically be brought about.

STATE AND FEDERAL LEGISLATION

The legislatures of nearly all the states have been in session sometime during the last twelve months, and the action taken by them indicates very clearly that there is a strong determination on the part of those who have the authority to make the laws and furnish the appropriations to continue this work as thoroughly and rapidly as possible. Laws were passed in some of the most important stock-raising states of the Middle West that will make it possible to complete the area testing in all of the counties within those states during the next twenty-four months. Laws were also enacted in other states which will aid materially in bringing about the completion of the work within the next few years.

Another feature of importance in connection with legislation is the increase in the maximum indemnity per head which has been provided by the United States Congress. In February, 1929, the maximum federal indemnity was increased from $50 to $70 per head on purebred cattle and from $25 to $35 per head on grade cattle, the other features of the federal law providing for indemnity remaining the same. The legislatures of thirteen states passed laws increasing the maximum indemnity for cattle in various amounts during the past year.
The appropriations made by the legislatures of the various states for tuberculosis-eradication work during the present year amount to approximately $11,600,000. In the states where the legislatures convene every two years, provision also was made for sufficient appropriations for another year. The federal appropriation for the present fiscal year amounts to $6,361,000, of which $5,171,000 is for indemnity and the remainder for operating expenses. There are other features in connection with the subject of legislation effective in various parts of the country that will be very helpful to the future conduct of the work.

**Area Work**

The area tuberculosis-eradication work continues to be the most important activity in connection with the campaign, and is making good progress in practically all of the states at this time. County cooperation is an important feature, in this connection, and the large amount of it in many of the states is encouraging and of benefit to the work as a whole. There has been a gain of 235 counties in the modified accredited area during the past year. On November 1, 1928, there were 598 counties in that status, and on November 1, 1929, 833 counties, parts of three counties, and 32 towns had been declared modified accredited areas.

On May 1, 1929, the last county in the state of Maine was declared a modified accredited area, making the Pine Tree State the second state in the Union to have all of its counties placed in the modified accredited area.

The retesting of the cattle in the modified accredited areas after the three year period of modification has resulted in finding that tuberculosis among cattle exists to but a slight degree in 131 counties where the cattle were retested, in order that the counties might be reaccredited. In all of these counties the degree of infection was such that the county could be remodeled under the provisions of the uniform plan.

The existing methods and rules governing area work continue to be satisfactory. The records of the Bureau at this time indicate that approximately 27 per cent of all the counties in the United States are in the modified accredited area, and, in addition, that there are 443 counties in which area work is in progress, making a total of 1,276 counties, or approximately 41 per cent of all the counties in the United States, in which area work is in progress or completed. The cattle contained in these 1,276 counties comprise approximately 45 per cent of the total cattle in
the United States. As time goes on it will be necessary, of course, to reaccredit more counties each year, and it is gratifying to know that those in charge of the work in the various states where these counties are located are making arrangements to conduct the necessary amount of tuberculin-testing in order that the counties may be reaccredited on time.

**Accredited-Herd Work**

There has been a slight decrease in the number of fully accredited herds from one year ago. On November 1, 1929, there were 176,723 herds, containing 2,376,506 cattle, included in this status, whereas, on November 1, 1928, the number of fully accredited herds numbered 177,989. In a number of the states where the area project is being conducted to a large extent, there has been less interest manifested in the individual accredited-herd work, but it is believed that the owners of breeding herds and other herds of importance should continue to keep up the plan of having all their cattle retested annually in order that they may be retained as fully accredited.

During the last few months another survey was made to learn how many fully accredited herds were removed from the list last year because of reactors found in them. This survey covered approximately 63,000 herds, and the results were about the same as reported a year ago, in that 3.4 per cent of all the accredited herds retested were found to contain reactors. About 73 per cent of these infected herds were located in counties not in the modified accredited area. The reinfection could be accounted for in approximately 70 per cent of the infected herds, which was quite an improvement over the survey made in 1925, when it was possible to account for only 40 per cent of the infected herds. In 67 per cent of the infected herds only one reactor was found, and not more than two reactors were disclosed in approximately 85 per cent of the infected herds, thus indicating that the disease had made but very little progress in these accredited herds.

**Cattle Tested for Interstate Shipment**

Almost twice as many cattle are moved interstate for dairy and breeding purposes than was the case in the beginning of the cooperative tuberculosis-eradication work. Last year the records indicate that approximately 455,000 cattle were tuberculin-tested for interstate shipment, and that all but about 45,000 of them were tested by approved practicing veterinarians. The degree of infection reported among the cattle offered for interstate
shipment was 0.4 per cent, which indicates that the enforcement of the regulations requiring the tuberculin-testing of cattle for interstate shipment resulted in preventing more than 2,000 diseased cattle going into other states and mingling with other possibly clean herds.

APPRAISAL, INDEMNITY AND SALVAGE

The average salvage received for reactor cattle during the past fiscal year was greater than at any period since the beginning of the cooperative campaign. This was due largely, of course, to the increase in the price of cattle sold for beef purposes. The average salvage received during the fiscal year ended June 30, 1929, was approximately $46.00, and this figure has been maintained up to the present time. The average appraisal of condemned cattle is higher than it has been heretofore, due, of course, to the increased value of all cattle. There has been a slight increase in the average state payment and, also, in the average federal payment, due to the increase in the maximum federal indemnity, of which I have previously spoken.

PUBLICITY IN THE CAMPAIGN

Some valuable contributions have been made to the campaign during the past year in the form of publications of various kinds. The distribution of publications helpful to the campaign continues to be an important factor in its progress. There have been quite a number of local publications in the various states and counties that have been of much benefit. These publications are not lengthy, but do contain some pertinent information concerning the status of the campaign. Distribution of maps of the states wherein area work is being conducted to a considerable extent is found to have been of value, as it readily indicates the progress of the work. Among the various articles helpful to the campaign that have appeared during the past year, I take pleasure in mentioning the following:


4. Circular 23, by Dr. L. Van Es, Department of Animal Pathology and Hygiene, University of Nebraska, revised to January, 1929.

These publications and many others that have been distributed during the last year have, without doubt, been very helpful to the cooperative campaign to eradicate tuberculosis among live stock.

Popular articles appearing in the daily, weekly and monthly papers attract a great deal of attention, and serve a valuable purpose in connection with the dissemination of proper information to the public regarding this problem. Miscellaneous Publication No. 66, which is being prepared by the United States Department of Agriculture, giving an outline of some of the economic benefits of having tuberculosis-free live stock, will soon be ready for distribution, and it is believed that it will be of much interest and value to the campaign at this time. Much helpful publicity has been widely distributed during the past year via our most modern method of communication which is, of course, the radio.

Avian Tuberculosis

Reports now available indicate that some progress has been made in suppressing avian tuberculosis. The results thus far obtained serve to indicate that substantial progress can be made in the program to control and eradicate avian tuberculosis if sufficient attention is given to the project. Methods found to be of value are those of education and information. Valuable information, widely distributed throughout the sections of the country where this disease exists to a great extent, is responsible for much of the success thus far obtained. The proficient services rendered by the veterinarians in the field who are conducting tuberculosis eradication work among cattle have also contributed much toward these good results. However, much more work remains to be done in connection with this campaign before it will be possible to have the degree of avian tuberculosis reduced as low as that of bovine tuberculosis in some counties. It is believed that this can be accomplished if sufficient concentrated effort is applied.

Tuberculosis in Cattle and Swine

There has been a slight decrease in the percentage of tuberculosis in swine found during the past year at establishments where federal meat inspection is maintained. The average retentions for the fiscal year ended June 30, 1929, amounted to 11.5 per cent, whereas, they were 12.1 per cent during the previous fiscal year. Slightly less than one per cent of all the cattle slaughtered under federal inspection, exclusive of known reactors, during the
last fiscal year, were found to show evidence of tuberculosis. This percentage is the lowest point reached since the inauguration of the cooperative campaign.

It is gratifying to observe that substantial progress has been made in the cooperative tuberculosis eradication work, as evidenced by marked reductions in the numbers of tuberculous cattle and swine reported each year at establishments where federal meat inspection service is maintained. I am glad to know that a more detailed report in connection with the economic value of this work to the livestock industry is to be featured as a part of this program.

**Para-Tuberculosis**

Only a small amount of work was done in connection with the testing of herds of cattle for Johne's disease during the past year, but information received seems to indicate that this disease is not causing any serious losses at present.

**Table I—Annual results of tuberculin-testing of cattle in the United States under the Cooperative Tuberculosis Eradication Plan, 1917 to 1929**

<table>
<thead>
<tr>
<th>Year Ended June 30</th>
<th>Cattle Tested</th>
<th>Reactors</th>
<th>Number</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1917</td>
<td>20,101</td>
<td>645</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>1918</td>
<td>134,143</td>
<td>6,544</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>1919</td>
<td>329,878</td>
<td>13,528</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>700,670</td>
<td>28,709</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>1921</td>
<td>1,366,358</td>
<td>53,768</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>1922</td>
<td>2,384,236</td>
<td>82,569</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>1923</td>
<td>3,460,849</td>
<td>113,544</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>1924</td>
<td>5,312,364</td>
<td>171,559</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td>7,000,002</td>
<td>214,491</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>8,650,780</td>
<td>323,084</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>9,700,176</td>
<td>285,361</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>11,281,490</td>
<td>262,113</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>11,683,720</td>
<td>206,764</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>62,024,793</td>
<td>1,762,979</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

The growth of the modified accredited area continues to be the most conspicuous evidence that the campaign to eradicate bovine tuberculosis is meeting with success. An observation of the map of the United States, which is available at this meeting, showing the situation as regards the modified accredited areas on November 1, 1929, brings this out very clearly. The support rendered this work by the various state legislatures and the
### Table II—Record of tuberculin-testing, cooperative tuberculosis eradication work, fiscal year 1929

<table>
<thead>
<tr>
<th>STATE</th>
<th>HERDS TESTED</th>
<th>CATTLE TESTED</th>
<th>REACTORS FOUND</th>
<th>PER CENT REACTORS</th>
<th>INFECTED PREMISES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>2,740</td>
<td>56,268</td>
<td>54</td>
<td>0.1</td>
<td>23</td>
</tr>
<tr>
<td>Arizona</td>
<td>3,219</td>
<td>54,303</td>
<td>590</td>
<td>1.1</td>
<td>297</td>
</tr>
<tr>
<td>Arkansas</td>
<td>4,873</td>
<td>24,153</td>
<td>62</td>
<td>0.2</td>
<td>47</td>
</tr>
<tr>
<td>California</td>
<td>1,982</td>
<td>106,171</td>
<td>1,057</td>
<td>1.0</td>
<td>337</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,084</td>
<td>20,001</td>
<td>458</td>
<td>2.3</td>
<td>207</td>
</tr>
<tr>
<td>Connecticut</td>
<td>6,070</td>
<td>85,356</td>
<td>2,034</td>
<td>2.4</td>
<td>723</td>
</tr>
<tr>
<td>Delaware</td>
<td>2,717</td>
<td>31,844</td>
<td>1,386</td>
<td>4.4</td>
<td>380</td>
</tr>
<tr>
<td>District of Columbia</td>
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**Totals:** 1,030,679 | 11,683,720 | 206,764 | 1.8 | 69,881

*Figures not available.

Note: Above table includes records of tuberculin-testing done under the area plan.
United States Congress is an indication of its importance as viewed by those bodies. It is hoped that this necessary support will be continued, and that there will be no relaxation in the activities to continue the work properly to control and eradicate bovine tuberculosis effectively.

More work will have to be done in connection with the avian tuberculosis problem, but with the foundation already laid it appears probable that good gains can be made along this line within the next few years if proper support is forthcoming. The spirit of cooperation among all the workers in the campaign is excellent, and I hope that the good work that has been done may continue, to the end that we may be able to report to this Association, which has contributed so much to the efficient working program, much more progress within a very few years.

![Map of United States showing status of bovine tuberculosis eradication on area basis](image)

**Fig. 1. STATUS OF BOVINE TUBERCULOSIS ERADICATION ON AREA BASIS**
(Revised to November 1, 1929)

The white portions of the map are modified accredited areas, signifying 0.5 per cent or less of tuberculosis among cattle, as shown by tuberculin tests. On November 1, 1929, the modified accredited areas included 833 counties, parts of 3 counties, and 32 towns.

Counties thus far classed as modified accredited areas constitute approximately 27 per cent of all the counties in the United States. In addition, area work is in progress in 425 other counties.

The development portrayed on this map has occurred since July, 1923, when 17 counties in 4 states were designated as the first modified accredited areas.
THE IMPORTANCE OF BOVINE TUBERCULOSIS ERADICATION FROM AN ECONOMIC STANDPOINT

Part I

By A. J. Glover, Fort Atkinson, Wisconsin
Editor, Hoard's Dairyman

Leaders in the live stock industry began to pay serious attention to the disease, tuberculosis, thirty-five or more years ago. The discovery of tuberculin as a diagnostic agent gave opportunity to locate the disease and to begin a systematic study as to how it could be eradicated. For a period of twenty-five years many live stock farmers and breeders tuberculin-tested their herds and eliminated reactors. In this period little was accomplished toward reducing this insidious disease but it was a valuable educational period, for during this time many discussions were held at state and national meetings concerning the ravages of bovine tuberculosis and the value of eradicating it.

Many public demonstrations were held to show the effects of tuberculosis and the accuracy of the tuberculin test as a diagnostic agent. It was held, and rightfully, too, that tuberculosis was both a health and economic question. Knowledge of this disease during this period, of course, was imperfect and extravagant claims were made concerning its danger to health and, undoubtedly, it was overestimated as to what the disease was costing the live stock industry. At any rate, objections were raised, on the part of many who owned diseased herds, to any system that would locate the tuberculous animals and take them from their herds.

There was nothing unusual about these objections for no progress is made without resistance. In time, however, it became so self-evident that bovine tuberculosis was a heavy drain upon live stock interests that the leaders soon saw the wisdom of attempting to clean up their herds. It took approximately a quarter of a century for them to comprehend that they were
bearing very largely the cost of this disease and were handicapped in many ways by harboring it in their herds. It was also comprehended, during this period, that promiscuous testing, that is, testing a herd here and there and eliminating reactors, would not accomplish the desired result, which is to get rid of all tuberculous contagion. It was little use for a stock-owner to test and eliminate reactors if his cattle ran in a pasture that adjoined one of a neighbor who owned an infected herd. It became plainly evident that the only way to attack this disease was on the area plan and the county in most instances has become the unit.

Since the adoption of the area plan of tuberculin-testing, the work of eradicating bovine tuberculosis has gone forward rapidly and satisfactorily. Here and there, to be sure, there are still objectors but they are so few in number as to offer scarcely enough resistance to stimulate those in charge of this work to put forth their best efforts.

It is doubtful whether any of us really comprehended, at the beginning, the magnitude of the undertaking or fully understand the value of ridding our herds and flocks from tuberculosis. No other nation has ever attempted to destroy a disease so widely disseminated and undoubtedly we would not have begun this work if we had had as high a percentage of tuberculosis in this country as is found in many European nations. Breeders and dairy farmers of many of these nations are paying a staggering price and one they cannot well escape because the disease has become so widely disseminated and because such a high percentage of their live stock is affected. It would bankrupt these nations to attempt to destroy the disease upon the plan we are following which is, namely, to destroy the contagion.

The leaders of this association and those in the live stock industry must be commended for their foresight and understanding and the men who own live stock should receive high praise for their willingness to submit their herds to the tuberculin test. It took great courage in many instances upon their part. We have advanced far enough in this undertaking to feel assured that it is only a matter of a few years when we can reduce this disease to a negligible consideration and many entertain the hope that it can be ultimately wiped from the face of the earth.

To indicate the magnitude of the undertaking to eradicate bovine tuberculosis and the progress that has been made, permit me to cite a few figures.
In the fiscal year ending July 1, 1929, 11,683,720 head of cattle were tested and 206,764 reacted (1.8 per cent). On October 1, 1929, we had under state and federal supervision 2,696,677 herds, containing 25,033,922 head of cattle, or more than 50 per cent of the cattle population is under state and federal supervision. On the same date, we had 833 modified accredited counties, which means that all their cattle have been tuberculin-tested and found to contain less than one-half of one per cent reactors. The encouraging part and the one that shows true progress is indicated by the fact that at the beginning of the area test 4.9 per cent of all cattle tested were found to be reactors, and for the year ending July 1, 1929, there were only 1.8 per cent reactors.

The records of swine indicate that tuberculosis was found in 11.5 per cent in 1929, while in 1924, the year in which the high point was reached, the percentage was 15.2. Two per cent of retained hogs were condemned or sterilized in 1928; while in 1924, 2.7 per cent of the retained hogs were either condemned or passed for sterilization. The following comparison will bring to your mind some losses that have been prevented as a result of the campaign to control and eradicate tuberculosis among live stock.

The number of cattle slaughtered in establishments under federal supervision during the fiscal years 1921 and 1929 was about 8,200,000, but there were 51,000 fewer cases of tuberculosis found among the cattle in 1929 than in 1921. The number of cattle carcasses condemned as unfit for food on account of tuberculosis was 8,191 less in 1929 than in 1921 (known reactors not included).

Dissemination of Tuberculosis Through Sales

Before attempt was made to eradicate bovine tuberculosis, this disease was spread by infected cattle through private and public sales. It was not uncommon in the dispersal sale of cattle suffering from tuberculosis to spread the disease to many herds and ultimately have it spread throughout the community because of pasture contacts. Public and private sales became one of the most effective ways of spreading tuberculosis and the losses sustained by the purchasers were enormous. No one can calculate this loss, but it is known that many herds became infected in this way and men who desired to become breeders of dairy cattle were defeated in their purpose because their early purchases contained diseased animals. Those instances were
extremely unfortunate, both for the advancement of the live 
stock industry and for the individuals.

In the early days, when the leading live stock men saw the 
advantages of testing their herds and eliminating reactors, there 
were certain cattle-buyers who purchased and sold diseased 
animals for breeding and dairy purposes. This, of course, was a 
scurrilous and dishonest practice, but the buyers who did not 
believe in the tuberculin test were glad to get these cattle cheaper 
than what they would have to pay for healthy ones.

Organized effort to eradicate bovine tuberculosis has put an end 
to dissemination of disease by selling infected cattle for dairy and 
breeding purposes and it is a great boon to the live stock industry. 
It is a sound and wholesome plan which provides for destroying 
and burying contagion. It is unfortunate, for the live stock 
industry, that there is not some way of handling certain persons 
in a similar manner. An industry so large and important as the 
live stock industry cannot be built upon any other basis than 
that of integrity and square dealing and with herds free from 
diseases.

THE MEANING OF THE WORK

What does this work mean to the dairy industry? It is difficult, 
indeed, to measure its returns in dollars and cents, for it reaches 
beyond monetary consideration.

We know that the consuming public is now receiving a better 
milk supply than when this work started. The consumption of 
dairy products has increased 30 per cent, or about one-third of a 
quart of milk per capita per day. This increase has in round 
numbers returned to dairy farmers five hundred million dollars 
anually, a sum of no mean proportion. This increased con-
sumption has stabilized the dairy industry, dignified it, empha-
sized its importance, and improved the health of thousands of 
people in our country.

The progress made to increase the consumption of dairy 
products has been a potent factor in making this branch of agri-
culture more secure and attractive. This work, without doubt, 
has not only eliminated diseased animals, but has stimulated the 
farmer to pay more attention to the selection of his cows, and to 
feed and care for them better. According to government reports 
in 1917 the national herd consisted of 22,849,000 cows, and in 
1929, 21,820,000 cows, or we have 1,074,000 less cows now than 
we had twelve years ago. Nevertheless, we are able to provide
dairy products for eighteen million more people than we were in 1917 and we have increased the consumption of milk better than thirty per cent. Since these demands are met with over one million less cows, it challenges our imagination and gives us a vision of what can be done to increase the returns of a great industry when we have healthy cattle properly bred, fed and handled.

Tuberculosis eradication has not only caused the consumer to use more dairy products, but it has increased the sale prices of dairy and beef cattle. It would be most difficult to state exactly how much more cattle are selling for since they can be purchased from herds known to be free from this disease. It would be a conservative estimate to say $25 per cow and there are instances where it amounts to many times this sum.

The owner of diseased cattle not only is forced to sell at lower prices, but loses opportunity to make sales to those seeking dairy cows. The market for healthy dairy cows has been, in other words, stimulated because the disease in many herds has been subdued. It was estimated that every worn-out dairy cow, and we presume every beef animal, sold for less money in the market because a certain percentage would be found with tuberculosis. The prices, in short, are higher for cattle used for beef, since the buyers know that their losses will be negligible when coming from accredited herds.

HERD IMPROVEMENT ASSOCIATIONS

Only a few years ago we estimated that the average cow produced less than 4,000 pounds of milk containing about 140 to 150 pounds of fat. Today we estimate that the average cow produces approximately 5,000 pounds of milk containing nearly 200 pounds of fat. The cows in herd improvement associations average about 7,500 pounds of milk containing 290 pounds of fat.

A herd improvement association consists of approximately 26 breeders or dairy farmers and its purpose is to determine what each cow is producing and the approximate amount of feed consumed. A person is employed to weigh and test the milk of each cow once a month. From these records it is estimated what she produces in a year. It is unnecessary to relate how important such work is among breeders and dairy farmers and that it could not go forward, to best advantage, at least, if tuberculosis were rampant in our country.
Farmers whose herds are suffering from disease are too dis-couraged to undertake improvements or to follow practices which are the most profitable. It cannot be estimated what value it has been to increase the production of the cattle of this country by having them free from tuberculosis. It is not expecting too much for all our herds to average ultimately what those in herd improvement associations are now averaging, and when they do, it requires but a moment's reflection to determine the value of such work. It would be a good speculative problem for someone to work out, that is, determine just what it means to the income of the dairy farmers and breeders to keep over one million less cows than twelve years ago and meet the requirements of eighteen million more consumers.

The increased production of our dairy herds is making a new demand upon the breeder. It is calling for better bulls—for those that have been proved for high production. No breeder can hope to establish blood-lines of known production if his work is to be constantly interrupted by outbreaks of disease and especially one like tuberculosis. With the elimination of reacting animals, the breeders' program is not likely to be interrupted, and he can employ such methods as will secure blood that will be definitely proven to do certain things.

Through the use of proven sires for high production, through intelligent selection and better feeding, it will be possible for the dairy industry to meet the increased demands of our growing population for many years without increasing the national dairy herd. It would be possible now to take care of the entire needs of our people with a herd of fourteen million cows instead of twenty-one million if all cattle were equal to those in herd improvement associations. To do this effectively and economically, there must be no lurking germs to destroy their efforts or to claim their profits.

**Quality Products**

Greater pride comes to the farmer, whether he be a breeder of dairy cattle or beef, if he has his herd free from disease. We know that healthy cattle utilize the feed better than diseased ones, they make better growth and better production. We also know that when a person has greater pride in his work he gives better attention to his herd and flock and this in itself means a tremendous increase in the returns for his efforts.

Many of our cities are demanding milk from herds free from tuberculosis as shown by the tuberculin test. They are not satis-
fied with only pasteurization as a protection of their milk supply, but demand it to come from healthy cows. This demand has brought a willingness to pay a higher price for milk and it has stimulated the farmer to put a better quality into his product. We can't overestimate the value of quality in increasing the demands and the consumption of dairy products.

I am reminded of the wise one, Haykem, who lived in the city of Bagdad. Many people went to him for counsel which he gave freely to all, asking nothing in return. There came to him a young man who had spent much, but got little.

He said, "Tell me, wise one, what shall I do to receive the most for what I spend?"

Haykem answered, "A thing that is bought or sold has no value unless it contains that which cannot be bought or sold. Look for the priceless ingredient."

"But what is the priceless ingredient?"

Spoke then the wise one, "My son, the priceless ingredient of every product in the market-place is the honor and integrity of him who makes it and markets it. Consider his name before you buy."

We must put in our live stock products that which cannot be bought or sold. We must put honor in our work which will not only increase the consumption of products but will bring better prices for them.

It is impossible to measure the dollars and cents income by eradicating tuberculosis. We know that it runs into the millions and it brings to those who are producing live stock a greater pride in their business. When pride enters into a business, drudgery departs, so we have manifold returns for the effort expended in the eradication of bovine tuberculosis.

THE IMPORTANCE OF BOVINE TUBERCULOSIS ERADICATION FROM AN ECONOMIC STANDPOINT

Part II

By W. T. Spencer, Omaha, Nebr.

Live Stock Commissioner

From the time of Abel, when he was a keeper of sheep, and offered up the finest of the flock as a sacrifice, on down through
the years, the animal kingdom has filled an important place in the affairs of man. It has become increasingly important as science has demonstrated the many and varied uses to which the products may be employed for the general welfare of man, and as packers and manufacturers have found new and broader fields for marketing them. I think most of us are prone to think of the contribution of the live stock industry to the welfare of man in that it furnishes the juicy roasts and fine steaks, the milk, butter and cheese that supply practically one-half of the sixteen hundred pounds of the yearly food that the average American consumes. But this, no no means, is the whole of the important niche that this great industry fills in the social life of the human race. Much of our clothing, furniture, bedding and other supplies in the home is directly or indirectly supplied through this industry, and most of the accessories, such as brushes, combs, buttons and hundreds of the everyday needs are derived from this same source.

There are a hundred and more pharmaceuticals that are derived from the by-products of cattle, hogs and sheep. Some of these are used extensively and have proved extremely valuable in the treatment of human diseases: for instance, pepsin, adrenalin, thyroid extract and insulin—one of the more recent by-products that has been so beneficial in the treatment of diabetes.

The research work that has developed these by-products from the glands of animals, most of which are entirely waste matter, is an interesting and fascinating study. It requires 25,000 glands to produce one pound of adrenalin, which is worth $5,000 per pound as a finished product. At the present time work is being conducted that promises an extract from the liver that will be as useful in the treatment of pernicious anemia as has insulin in the treatment of diabetes. It is believed that the future will add many other by-products of the animal industry which will add greatly to the value of domestic animals.

The pioneers of modern meat-packing were among the first of the large business interests to recognize that man can not live unto himself, that cooperation is the life of trade, and if they were to succeed in the meat-packing business the live stock grower likewise must prosper. They, therefore, interested themselves in promoting a better live stock industry by improving the quality and developing new and broader markets for the finished product. Mr. F. Edson White, president of one of the large
packing companies, recently said, "The problems of the packing industry do not lie so much in the management of its great plants, processing systems and packing-houses as it does in the distribution and merchandising of its products." Even our home market has been greatly handicapped in the past decade or two by an unfounded prejudice against the use of meats, brought about by an extensive campaign of advertising by some manufacturers of other food products, that meat was not a healthful food and should not be used in the human diet. Science has proved such statements to be unfounded. I think it is up to those of us directly interested in the livestock industry to assist the National Live Stock and Meat Board, and Institute of American Packers, in every way possible in their effort to overcome the prejudice created against the use of meats by adverse propaganda.

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<td>211,835</td>
<td>3,276</td>
<td>1.5</td>
</tr>
<tr>
<td>1925</td>
<td>361,706</td>
<td>4,470</td>
<td>1.2</td>
</tr>
<tr>
<td>1926</td>
<td>476,841</td>
<td>5,140</td>
<td>1.1</td>
</tr>
<tr>
<td>1927</td>
<td>413,701</td>
<td>3,876</td>
<td>0.9</td>
</tr>
<tr>
<td>1928</td>
<td>368,445</td>
<td>3,801</td>
<td>1.0</td>
</tr>
<tr>
<td>1929†</td>
<td>346,910</td>
<td>1,929</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Nebraska has 38 accredited counties and 45 counties under test.
†First ten months.

One of the problems in extending the market for meat food products in foreign countries was that of proper inspection. This has been met and solved through the most extensive and thorough governmental inspection services of any nation in the world. This service, conducted by the Bureau of Animal Industry, not only has been beneficial in increasing the outlet for meats but it has through its extensive system of records, and well organized force of trained men, furnished definite and accurate information as to the kind of infectious diseases prevalent in our food-producing animals, and the location of these various diseases. This has been especially valuable as applied to the disease, tuberculosis. The information obtained through this service relative to tuberculosis showing such rapid increase over a short
period of years, prompted the various live stock interests to urge the federal and state governments to organize for a systematic campaign against this disease. Accordingly, in December, 1917, at a meeting of this association, plans were formulated and presented to the United States Bureau of Animal Industry, and were immediately adopted. The foundation of this plan, as you know, was the accredited herd plan. In 1918, the first year in which it was in operation forty of the states accepted the plan, and entered into cooperation with the United States government in an effort to control and eradicate tuberculosis from cattle.

Many of the more extensively affected herds of breeding cattle that had been and were supplying foundation stock to clean herds throughout the country were placed under this plan. In my own state we tested scores of such herds. This permitted us to clean up these herds, and furnished us leads which enabled us to locate other herds to which they had supplied additions, and in a number of cases induced the owners to accept the accredited-herd plan and place their herds under supervision. The results of this early work was far-reaching. It is impossible to estimate in dollars and cents the amount of good accomplished through the testing of pure-bred herds under this purely voluntary plan. In one county in Nebraska we knew of a badly infected herd where the owner could not be induced to place it under super-

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CATTLE SLAUGHTERED</th>
<th>RETAINED FOR TUBERCULOSIS</th>
<th>CONDEMNED AND STERILIZED CARCASSES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER</td>
<td>%</td>
<td>NUMBER</td>
</tr>
<tr>
<td>1918</td>
<td>1,041,038</td>
<td>13,149</td>
<td>1.26</td>
</tr>
<tr>
<td>1919</td>
<td>972,748</td>
<td>11,671</td>
<td>1.19</td>
</tr>
<tr>
<td>1920</td>
<td>778,006</td>
<td>8,156</td>
<td>1.04</td>
</tr>
<tr>
<td>1921</td>
<td>722,405</td>
<td>8,072</td>
<td>1.11</td>
</tr>
<tr>
<td>1922</td>
<td>847,981</td>
<td>8,063</td>
<td>0.95</td>
</tr>
<tr>
<td>1923</td>
<td>922,144</td>
<td>7,587</td>
<td>0.82</td>
</tr>
<tr>
<td>1924</td>
<td>931,564</td>
<td>7,135</td>
<td>0.80</td>
</tr>
<tr>
<td>1925</td>
<td>945,524</td>
<td>7,052</td>
<td>0.74</td>
</tr>
<tr>
<td>1926</td>
<td>1,007,874</td>
<td>7,622</td>
<td>0.75</td>
</tr>
<tr>
<td>1927</td>
<td>902,149</td>
<td>4,691</td>
<td>0.51</td>
</tr>
<tr>
<td>1928</td>
<td>801,908</td>
<td>3,844</td>
<td>0.47</td>
</tr>
<tr>
<td>1929†</td>
<td>706,094</td>
<td>2,303</td>
<td>0.32</td>
</tr>
</tbody>
</table>

*Note the gradual reduction in the number of retained carcasses since 1918, and the marked reduction in condemned carcasses since 1926.
†First ten months.
vision. It was a large and well-known herd of beef breed that had been furnishing breeding stock to many farmers in the county. A few years ago, when the county came under the area test, that county had double the amount of infection that was found in the adjoining counties, and without question the herd referred to was very largely responsible for the spread of the disease throughout that area.

The value of testing from an economic standpoint was well demonstrated in Clay County, Nebraska. In 1921 and 1922, 90 per cent of all of the cattle in that county were tested under optional agreement. The results of the test showed 22 per cent of all of the farms in that county had infection thereon; 3 per

**Table III—Total reactors slaughtered at Omaha, 1924 to 1928, inclusive**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>KILLED</th>
<th>CONDEMNED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER</td>
<td>%</td>
</tr>
<tr>
<td>1924</td>
<td>5,023</td>
<td>956</td>
</tr>
<tr>
<td>1925</td>
<td>6,239</td>
<td>1,146</td>
</tr>
<tr>
<td>1926</td>
<td>5,294</td>
<td>704</td>
</tr>
<tr>
<td>1927</td>
<td>4,062</td>
<td>416</td>
</tr>
<tr>
<td>1928</td>
<td>5,190</td>
<td>271</td>
</tr>
</tbody>
</table>

*This table is an inspection report of all reactor cattle slaughtered at Omaha since the records on such cattle have been kept separate. Note the reduction of condemned carcasses from 19 per cent, in 1924, to 5 per cent, in 1928.*

**Table IV—Total number of hogs slaughtered; percentage showing lesions of tuberculosis; total number of entire carcasses condemned and sterilized for tuberculosis at the Omaha market for the years 1921-1929, inclusive**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>HOGS SLAUGHTERED</th>
<th>RETAINED FOR TUBERCULOSIS</th>
<th>CONDEMNED AND STERILIZED CARCASSES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER</td>
<td>%</td>
<td>NUMBER</td>
</tr>
<tr>
<td>1918</td>
<td>2,520,355</td>
<td>192,264</td>
<td>7.62</td>
</tr>
<tr>
<td>1919</td>
<td>2,554,636</td>
<td>234,833</td>
<td>9.19</td>
</tr>
<tr>
<td>1920</td>
<td>2,000,050</td>
<td>255,050</td>
<td>12.5</td>
</tr>
<tr>
<td>1921</td>
<td>1,962,442</td>
<td>287,770</td>
<td>14.7</td>
</tr>
<tr>
<td>1922</td>
<td>2,222,654</td>
<td>370,074</td>
<td>16.6</td>
</tr>
<tr>
<td>1923</td>
<td>2,799,236</td>
<td>416,163</td>
<td>14.9</td>
</tr>
<tr>
<td>1924</td>
<td>3,100,210</td>
<td>424,882</td>
<td>13.7</td>
</tr>
<tr>
<td>1925</td>
<td>2,417,153</td>
<td>309,830</td>
<td>12.8</td>
</tr>
<tr>
<td>1926</td>
<td>1,772,060</td>
<td>247,964</td>
<td>13.9</td>
</tr>
<tr>
<td>1927</td>
<td>1,942,961</td>
<td>246,859</td>
<td>12.8</td>
</tr>
<tr>
<td>1928</td>
<td>2,069,993</td>
<td>231,755</td>
<td>11.4</td>
</tr>
<tr>
<td>1929†</td>
<td>1,926,362</td>
<td>201,326</td>
<td>10.4</td>
</tr>
</tbody>
</table>

*The first area testing done in the Omaha market territory was in the years 1921 and 1922. Following these years, the table shows a gradual reduction each year with the exception of one, in the percentage of retained hogs, and in the number of condemned carcasses which has been more than cut in two from the year 1922 to 1929. The figures above present the strongest and most convincing evidence in the economic importance in the reduction of tuberculosis that the most sanguine could have hoped for.

†First ten months.
cent of all of the cattle tested were found affected. The work was stopped and no further testing done following 1922, except perhaps a few scattered herds, until 1928, when it again came under test by legal action. An interval of six years had passed, but the results of that early testing were indicated by the fact that in the 1928 test only 6.5 per cent of the herds in that county were found affected, and one per cent of the cattle. We removed tuberculous cattle from 22 per cent of the farms in Clay County; if no further testing had been done at all we believe it would be probably twenty-five years before the county would have as much tuberculosis as it had in 1922.
(Most of the facts submitted in these tables have been obtained through the courtesy and from the records of the United States Bureau of Animal Industry, and the Nebraska Bureau of Animal Industry.)

The late Dr. A. J. Kiernan, in discussing before this body in 1917 the probable length of time that it would require to eradicate tuberculosis, said:

There absolutely are no grounds upon which a reasonable estimate can be made of the number of years it will take to eradicate this disease. All one can do is to make a guess as to the time, and, it is my belief that if this nation succeeds in eradicating tuberculosis in fifty years, it will be one of the greatest heritages our successors will have handed down to them.

Chart 2. Portraying the yearly trend of the percentage of tuberculosis found in all hogs killed under federal inspection in the United States for the years 1908 to 1929 inclusive. The line marked 00 indicates the percentage of tuberculosis that we would have had in 1929 if the same general average increase from 1918 to 1924 had prevailed. The line marked /// indicates the percentage of tuberculosis in hogs we would have in 1940 if the reduction continues on the same average as from 1924 to 1929.

The probability of completing this tremendous task in half this period of time is evidenced by the results of the progress made since this statement of Dr. Kiernan, just eleven years ago this month, shown by the accompanying charts (1 and 2).
### Table V

Money loss from all cattle and hog carcasses retained, sterilized and condemned for tuberculosis, at all packing-plants under federal inspection for the fiscal years 1908, 1918 and 1929; also the number of reactors slaughtered and disposition of same

<table>
<thead>
<tr>
<th>Year</th>
<th>Slaughtered</th>
<th>Loss from Retained Carcasses</th>
<th>Loss from Sterilized Carcasses</th>
<th>Loss from Condemned Carcasses</th>
<th>Total Loss</th>
<th>Total Loss Hogs and Cattle</th>
<th>Total Loss Less Reactors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1908</td>
<td>Hogs: 35,113,076 $ 196,510 $ 487,596 $ 848,008 $1,532,114</td>
<td>$2,091,497</td>
<td>$4,992,079</td>
<td><strong>$2,795,547</strong></td>
<td><strong>$2,611,177</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cattle: 7,116,247 53,138 41,486 1,169,808 1,283,433</td>
<td>177,832</td>
<td>184,370</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reactors: 5,451 3,074 3,464</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1918</td>
<td>Hogs: 35,449,247 $1,171,185 $1,729,396 $2,091,497 $4,992,079</td>
<td>$3,969,879</td>
<td>4,902,221</td>
<td>$9,894,300</td>
<td>$9,487,385</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cattle: 10,938,287 343,022 589,321</td>
<td>353,754</td>
<td>406,915</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reactors: 25,972 51,944 101,217</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>Hogs: 47,163,573 $1,856,489 $647,034 $935,744 $3,439,269</td>
<td>$2,207,782</td>
<td>2,826,963</td>
<td>$6,266,232</td>
<td>$4,859,315</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cattle: 8,284,324 360,879 258,302</td>
<td>990,850</td>
<td>1,406,917</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reactors: 163,332 254,929 161,138</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
We have had a number of outbreaks of foot-and-mouth disease in this country which have attracted much attention. The most serious was in 1914, starting in Michigan and spreading to twenty-two states before being entirely brought under control. There were 168,158 animals slaughtered in this campaign, valued at $5,676,000. This loss induced much comment, and fear was expressed that it would seriously affect the meat-food supply of the nation, but this sum, great as it was, amounted to only approximately one-half the money loss that was sustained from condemned tuberculous meat products in packing-houses under federal inspection during the year 1918, which amount totaled $9,894,300.71, and only about 60 per cent of the animals slaughtered for food purposes in the United States were inspected under this system.

Table V is submitted for the purpose of showing the money loss from cattle and hog carcasses, and parts of carcasses condemned on account of tuberculosis, based on the live weight market values. The hogs are valued on a loss of 30 cents a head on retained carcasses for the year 1908, and 35 cents a head for 1918 and 1929; 50 per cent of the live weight cost on sterilized

<table>
<thead>
<tr>
<th>YEAR</th>
<th>HOGS</th>
<th>TOTAL KILL</th>
<th>RETAINED</th>
<th>CARCASSES CONDEMNED AND STERILIZED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NUMBER</td>
<td>%</td>
<td>NUMBER</td>
</tr>
<tr>
<td>1926</td>
<td>Accredited</td>
<td>96,765</td>
<td>10,019</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Non-accredited</td>
<td>926,603</td>
<td>158,927</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,023,368</td>
<td>148,946</td>
<td>14.5</td>
</tr>
<tr>
<td>1927</td>
<td>Accredited</td>
<td>241,755</td>
<td>17,892</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Non-accredited</td>
<td>892,457</td>
<td>133,298</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,134,212</td>
<td>151,190</td>
<td>13.3</td>
</tr>
<tr>
<td>1928</td>
<td>Accredited</td>
<td>426,422</td>
<td>30,190</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Non-accredited</td>
<td>869,273</td>
<td>118,565</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>Total market run</td>
<td>1,295,695</td>
<td>148,755</td>
<td>11.5</td>
</tr>
<tr>
<td>1929</td>
<td>Accredited-tattooed</td>
<td>122,262</td>
<td>4,697</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>Non-accredited and untattooed-accredited</td>
<td>1,190,628</td>
<td>157,325</td>
<td>13.1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,312,890</td>
<td>142,020</td>
<td>11.1</td>
</tr>
</tbody>
</table>
carcasses and 90 per cent of the live weight cost on condemned carcasses.

The values on cattle are based on $1.25 per head, $2.00 per head and $1.75 per head on retained carcasses for the respective years, 1908, 1918 and 1929; 40 per cent of the live weight cost for sterilized carcasses and 70 per cent of the live weight cost for condemned carcasses.

There has been expended by the United States, the various states and county governments in the nation approximately $100,000,000.00. The saving on meat food products for the fiscal year 1929 over 1918 was $3,628,066.30, a fair rate of interest on investment, not considering dairy products or increased values of breeding stock.

I do not consider the figures for 1929 very reliable, as approximately 500,000 accredited hogs were killed in the general kill unidentified, and of the accredited hogs that were tattooed the records are not entirely correct. I think most of the other Corn Belt market records will show about the same results as Omaha.

A significant fact is portrayed by the following figures: At Omaha, during the year 1918, 8.5 per cent of the total kill of hogs were retained. In the year 1922, 16.6 per cent, or an increase of 8.1 per cent. In the year 1918 there were 9.9 per cent retained at all plants under federal inspection in the United States. In 1922, 14.3 per cent were retained, an increase in the nation of 4.4 per cent. There was a much greater increase in the retained hogs at Omaha, in spite of the fact that we had a reduction in the number of cattle retained for tuberculosis for the same years, from 1.26 per cent in 1917, to 0.75 per cent in 1922, while the national figures for the same years are 1.8 per cent in 1918, and 1.75 per cent in 1922. The condemnation of hog carcasses at Omaha and in the nation at large were relatively unchanged. This, it seems to me, is a plain indication that the retentions in hogs at Omaha during this period were largely from a new source of infection and substantiates Dr. L. Van Es' statement just recently made:

There is a steady stream of infection from poultry to swine and we know now that this accounts for the greater part of cases of the spread of tuberculosis which causes swine to be retained by the meat inspection service.

This same opinion is voiced by Dr. A. F. Schalk, of North Dakota and Dr. Robert Graham, of Illinois, and others.

President Hoover, in issuing his call for a conference with business and industrial leaders recently, said:
My own experience has been, that words are not of any great importance in times of economic disturbance; it is action that counts.

It seems to me that the very careful study that has been given to the problem of tuberculosis in poultry over a period of several years and the facts that have been uncovered are so convincing as to their importance in the economics of tuberculosis eradication that it is time for more definite action to be taken.

Again I want to quote from Dr. Kiernan, speaking before the Eastern States Tuberculosis Conference, June, 1924, when he said:

Tuberculosis among fowls is quite readily recognized, and as the individual flocks can be dispersed without great damage or financial loss, such action is recommended, and by careful selection in replacing the flocks, tuberculosis-free flocks can be established and maintained, thus doing away with the menace to the swine industry from that source.

Dr. Schalk's experiments seem to indicate that avian tuberculosis germs will remain alive for more than a year in badly infected lots. This is further evidence of the necessity of early and extensive action for the control of fowl tuberculosis.

Indications are that we will not be able to reduce to a great extent swine tuberculosis in modified accredited counties other than through a systematic and vigorous campaign on fowl tuberculosis. Therefore, I want to suggest that this association appoint a special committee to work with the proper representatives of the United States Bureau of Animal Industry and the several state livestock sanitary departments to assist in working out plans so that a more definite program for the eradication of avian tuberculosis may be put into operation in the near future.

PRESIDENT LAMB: Gentlemen, have you any remarks, criticisms or comments to make on the papers you have heard from Mr. Glover and Dr. Spencer? If not, we will proceed to the next paper which is "The Efficiency and Limitations of Tuberculin Tests," by Dr. S. E. Bruner, Harrisburg, Pa.

DR. M. JACOB: I received word from Dr. Bruner that at the last moment he could not be here. He did not send his paper.

DR. SPENCER: Is it out of order to ask whether the Association wants to consider the suggestion I made?

PRESIDENT LAMB: Does the Association desire to take action on the suggestion of Dr. Spencer, that a special committee be appointed to consult with the Bureau of Animal Industry and the various states relative to this matter?

DR. W. J. BUTLER: Does Dr. Spencer make that as a motion? If he does, I second it.

DR. SPENCER: I make it as a motion.

PRESIDENT LAMB: Dr. Spencer has made a motion, seconded by Dr. Butler, that this Association appoint a special committee to work in association with and through the Bureau of Animal Industry, looking toward a more definite program of tuberculosis eradication in poultry.
DR. SPENCER: It has been suggested by one or two that the Tuberculosis Committee could handle that. If they can and will, that is just as good a way as any for handling it. Probably there might be some discussion as to whether or not it should be handled that way or through a special committee.

PRESIDENT LAMB: Do you want to discuss the proposition of submitting this suggestion of Dr. Spencer to the Tuberculosis Committee for their consideration, or do you want to authorize the appointment of a committee for this purpose?

DR. C. H. HAYS: I will submit, as a substitute motion, that the Chair be directed to instruct the Tuberculosis Committee to give special attention to the motion as put, in its regular duties. That will dispose of the question in a parliamentary way.

PRESIDENT LAMB: I assume, then, that the incoming president and the incoming Tuberculosis Committee, would be the ones to consider this matter.

DR. GEORGE HILTON: I second that motion.

PRESIDENT LAMB: Dr. Hays makes a motion that the incoming president be instructed to request his Tuberculosis Committee to consider and take action upon the matter presented by Dr. Spencer. Are there any remarks on that subject? If not, all in favor of that motion will please say "aye"; contrary-minded, "no." It is carried. You have instructed your incoming president to instruct his Tuberculosis Committee to consider the suggestion of Dr. Spencer.

The next paper on the program is "Vaccination of Calves Against Tuberculosis with Calmette-Guérin Culture, B.C.G.,” by Drs. C. M. Haring, J. Traum, F. M. Hayes and B. S. Henry, University of California, Berkeley, California. (Applause)

Dr. Haring read the paper. (Applause)

VACCINATION OF CALVES AGAINST TUBERCULOSIS WITH CALMETTE-GUERIN CULTURE, B.C.G.

By C. M. Haring, J. Traum, F. M. Hayes and B. S. Henry

Agricultural Experiment Station, University of California, Berkeley, California

When in June, 1924, Calmette and Guérin first published their offer to furnish B.C.G. cultures for experimental trial, the writers took under consideration plans for testing this method of vaccinating animals against tuberculosis. The matter rested until 1926, however, when Mr. H. D. Williamson, of Napa, having read press notices of the French experiments, became interested in the possibility of controlling tuberculosis by means of this material in his dairy herd of about 200 cows on Grizzly Island in the Sacramento-San Joaquin delta. Plans were then developed for conducting formal investigations under controlled conditions at the California Agricultural Experiment Station, as well as for starting the work with the culture in the Williamson herd.

Only a summary of the results obtained by the writers to date is possible in the limited time available on the program of the United States Live Stock Sanitary Association. A publication*
of the California Agricultural Experiment Station is now in press which will give the results in more detail. A copy of that paper may be secured by writing to the Division of Veterinary Science, University of California, Berkeley.

Two hundred eighty-two calves, less than 10 days of age, and fifteen older cattle were treated with cultures or transplants of cultures received from Calmette. One hundred ninety-two of the calves were in an extensively tuberculous dairy herd, where vaccinations have been made for three years under partially controlled conditions. The remaining ninety calves were from herds free from reactors to the tuberculin test. These have been maintained with an equal number of non-vaccinated controls at the University of California Agricultural Experiment Stations at Berkeley and Davis.

Thirty of the ninety head were used to test the possibility of any injurious effects of B.C.G. on cattle in a presumably tuberculosis-free environment, and the remaining sixty were used to test the immunizing or resistance-producing power of the vaccine by exposing them to tuberculous infection under experimental conditions.

The subcutaneous vaccination of cattle with 100-mg. doses of B.C.G. conferred sufficient resistance to protect against the fatal effects of intravenous or subcutaneous injections of virulent tubercle bacilli.

In feeding trials with virulent tubercle bacilli, the vaccinated cattle showed less extensive lesions, as a rule, than the unvaccinated. The prolongation of the feeding of calves with massive doses of virulent tubercle bacilli apparently had no effect in increasing the number or size of the tuberculous lesions found on autopsy, four to twelve months later. The calves which received from two to ten infecting feedings had just as extensive lesions, on the whole, as those animals which were fed from 20 to 26 additional doses of much larger numbers of virulent tubercle bacilli. This was observed in both the vaccinated and non-vaccinated groups.

Feeding infection experiments with calves, following the intradermic, intravenous, or oral administration of B.C.G., indicated that these methods of vaccination are not superior to the subcutaneous.

The resistance afforded by the vaccine was not sufficient always to prevent the penetration of the walls of the alimentary tract by virulent tubercle bacilli. In most cases this induced a
caseation of the cervical and mesenteric lymph-nodes. The chief protective effect of B.C.G. seems to be in retarding the extension of tuberculous processes occurring from infection received subsequent to vaccination. Apparently the subcutaneous method of vaccination has furnished protection against the development of clinical cases of tuberculosis in heifers in a tuberculous dairy herd.

The non-progressive tuberculous changes or the local vaccination lesions, or both, will render the majority of vaccinated cattle hypersensitive for a time to the intradermal injection of tuberculin, making such animals temporarily less marketable in California except for beef.

B.C.G. appears to be somewhat effective in protecting against a fatal* termination of massive infection.

The resistance to tuberculosis conferred by subcutaneous, intravenous, intradermic, or oral methods of administration of B.C.G., as used at the California station, is not sufficient to justify the use of the vaccine on cattle where measures designed to eradicate tuberculosis in cattle are being successfully carried out. On the other hand, in countries or localities where control measures are proving ineffective or where eradication seems to be hopeless for many years in the future, the vaccine may eventually be found of economic value to cattle owners by preventing the occurrence of extensive or fatal lesions and by limiting the spread of the disease.

Observations of the effect of B.C.G. in cattle, swine, rabbits and guinea pigs at the California Agricultural Experiment Station have thus far failed to detect the production of any lesions which could be proved to be virulent by reinoculation.

The writers have observed that, under conditions prevailing in certain parts of California, it is not difficult to rear heifers free from tuberculosis until they calve for the first time. Owners are then often under the necessity of introducing the disease-free heifers into the infected milking herds. A possible use for B.C.G. may be found in the vaccination of such heifers. In the writers' opinion, if the resistance conferred is sufficient to prevent the development of open lesions, the problem of reducing the incidence of tuberculosis to a point where eradication meas-

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*The observation that subcutaneous vaccination with B. C. G. protects against the fatal effects of tuberculosis is supported by unpublished results obtained in the routine vaccination of monkeys kept at the George Williams Hooper Foundation for Medical Research, University of California, under the direction of Dr. K. F. Meyer. The vaccine used on the monkeys was made at the California Agricultural Experiment Station and was similar to that employed in the cattle experiments.
ures may be economical in such herds will have been solved. In view of this, experiments are being planned at the California Station to test out further the safety and practicability of vaccinating tuberculosis-free heifers during their first pregnancy and continuing their re-vaccination annually after they have been introduced into herds of tuberculous cattle.

**DISCUSSION**

**Dr. E. A. Watson:** I hardly like such an excellent contribution to the important study of tuberculosis vaccination to pass without one or two comments. I think you all realize, what is obvious enough, that this is one of the most important contributions that has been made on this continent to the study of B. C. G. It is difficult, if not impossible, at such a time, to analyze or discuss the authors' conclusions. For that we must wait patiently until his promised report in detail, with all the protocols of these experiments, is available.

There are just one or two general comments which I should like to have the privilege of making at this time, if I may. In all work that has been done on B. C. G. vaccination, and in all the reports that have been published up to this time, sufficient importance has not been given to the time factor, and conclusions have been drawn, not by Drs. Haring and Traum, but by others, that are unwarranted, in my opinion, owing to the very short period of time or duration of the experiment.

Most of the work reported today, as you will have noted, was on a trial duration, during the first few months of life. With the exception of the eight animals in the farm herd, all the other experiments had a duration of three to twelve months, I think. In other countries, conclusions have been based upon results of resistance observed during that relatively short period in the life of the animal. I do not think the importance of the time factor can be stressed too much in judging of the value and degree and duration of resistance to tuberculous infection or, which is a much better term, of course, immunity.

I think the whole trend of Dr. Haring's report shows that resistance is increased by B. C. G. That is all that we would expect. There is no argument, I think, that under certain sets of experimental conditions there is evidence that resistance is increased to subsequent infection by B. C. G., but we must realize what that resistance really means and what its practical value is. Reports that have been published showed beyond a doubt that the longer the animals were kept under observation, the longer the period of the trial, the greater was the number that showed lesions of tuberculosis.

In a recent publication, not a published report but a little leaflet sent out by the health organization of the League of Nations, there is a report from Holland, only a paragraph or two, summarizing the results of vaccination on 1,032 cows, of which 138 have been autopsied. It is very interesting and significant that animals vaccinated once, which would probably mean animals about one year of age, showed 5 per cent tuberculous; animals that had received two vaccinations, presumably between one and two years of age, showed 9 per cent tuberculous; animals that received three vaccinations, showed 25 per cent tuberculous. That, I think, is extremely significant, showing, as we have claimed again and again, that the real period of trial is not in the first year of life or possibly not in the second, but when those animals approach maturity, sexual maturity and reach the productive stage.

Again and again Calmette has quoted as conclusive evidence the immunizing efficiency of B. C. G. vaccination by reported results during the first few months of life. Surely that is not conclusive evidence. If it were so, why did the League of Nations, when they met in October a year ago, advocate for all countries a plan of experimentation and provided distinctly that it was to extend over a period of six years, until after the animals had reached maturity, and that no conclusions were to be arrived at until the end of the sixth year?
I would not mention human vaccination if it were not for the fact that when Professor Calmette and his supporters advocate vaccination of cattle, they refer to the wonderful results obtained by the vaccination of babies. When they advocate vaccination of babies they refer to the wonderful results obtained by the vaccination of cows. Actually, there is just as much difference of opinion as to the efficacy of the vaccination of human infants as there is of cattle. In a recent number of the *Revue Générale de Médecine Vétérinaire*, Professor Calmette severely criticizes the tuberculosis eradication methods carried out upon this continent, referring to them as illogical, unscientific, obsolete and nonsensical. Those are his words. He makes this peculiar statement:

"Can it be believed that human tuberculosis can be eradicated by the slaughter of all human beings affected with tuberculosis?"

I submit that that is the most puerile statement that a great scientist in his right mind could make. It would be just as reasonable to suggest could we treat bovine tuberculosis by putting all cows to bed in a sanatorium.

But as to the value or possible use of B. C. G. vaccine, it may have a use in human vaccination. As Dr. Haring said, B. C. G. vaccination tends to retard or delay progressive tuberculosis. Anything that retards or delays fatal disease in the human being, that prolongs life even for a few weeks or a few months or a few years, is justifiable. Is it justifiable to prolong the life of a tuberculous animal? Is there any advantage that tuberculosis should run a slow, most insidious, slower course with vaccination than if it ran a short, acute course? I submit that it would be no advantage in the control of tuberculosis in cattle, for the longer a bovine animal lives with tuberculosis, the greater is the danger of spreading the disease and the greater the number of cattle that are exposed to tuberculosis, and the advantage is the other way. The sooner a tuberculous animal, even if the lesions are not always open, gets to the abattoir, the better for all concerned.

One could argue until doomsday on the so-called retrogressive changes of open or closed lesions that are apparent during the first few months of life after vaccination with B. C. G. I am not going to say what is an open lesion or what is not an open lesion. We know this, however, from our abattoir experiences and autopsy experiences and with laboratory study—animals may eliminate virulent tubercle bacilli in the urine or in the milk, and at autopsy you do not always find open lesions.

Interesting work has just recently been done by Dr. Medlar, at the Mt. McGregor Sanatorium, on renal tuberculosis in humans. There has been a controversy as to whether there should be renal lesions when bacilli are eliminated in the urine. I understand from that exhaustive work that they could not always demonstrate that there were microscopic lesions in the kidney when tubercle bacilli are eliminated in the urine, and it often necessitated hundreds of thousands of sections to demonstrate such lesions.

We already have records on B. C. G. vaccinated animals that have passed three annual revaccinations and have produced calves of their own. Those animals in some cases are eliminating virulent tubercle bacilli in their milk. It is of no great import. I have never claimed that the bacilli that are being eliminated by these carriers originated with the B. C. G. vaccine; probably they did not. Probably they originated from extraneous infection after being exposed to it, but from a practical point of view it is of no great matter whether the bacilli being eliminated by vaccinated animals, through the milk, after they have become producing cows, or through the urine, have been derived from the B. C. G. or other source of infection. The fact that does matter is that they are eliminating virulent tubercle bacilli. I maintain that such animals are a constant danger to the animals with which they come in contact.

(Additional text not transcribed)
THE SOURCES OF TUBERCULOSIS

By L. Van Es, Lincoln, Nebr.

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The sources of tuberculous infection may be divided into primary and secondary ones. In the first group belong infected animals and in the second the polluted environment and its component parts, in which tubercle bacilli may maintain themselves in a viable, if not in a virulent, condition.

The infected animal is the fountain-head of tuberculous infection and seen in the light of the social-economic and hygienic importance of all forms and all types of the disease, it does not particularly matter to what species the tuberculous animal belongs or with what bacillary strain it happens to be infected. Thus every time a tuberculous animal is eliminated as an infection hazard, a gain in the direction of eradication is made. The latter is merely the consumation of several such gains.

In our national war against tuberculosis, we have not always directed our efforts against more than one tuberculous species at a time. In the case of bovine tuberculosis, it was certainly not a mistake to apply all our force on the elimination of the tuberculous cow, of the infected dairy or purebred herds where, for several decades prior to 1917, the disease could be incubated without molestation. In a similar manner we concentrate our efforts on human infection and now also on the superabundant source of tubercle bacilli to be found in poultry flocks.

Not that in all animals these heterogenous infections are a menace at this time. They will be in the future, because with the disappearance of one type of infection another type is apt to take its place. After all, the variability of the tubercle bacillus in its pathogenic attributes is the means by which it can maintain its place in nature as a specific entity.

This place is one of an obligate parasite and hence the organism must either be able to adjust itself to new hosts or to perish. We may here remind ourselves that no species of any biologic form has even perished through human efforts and that it would be erroneous to think that it can be done with the microscopic tubercle bacillus. What we can do, what we are doing now, is to make the disease so rare, so sporadic, that it becomes only a relatively slight factor in the total of our losses and our sorrows.
We are now rapidly approaching this condition with regard to bovine tuberculosis and hence we may begin to prepare to deal adequately with the other varieties of tubercle bacilli, as well as with the bovine ones which remained in hosts which were not considered in the campaign.

We must bend our efforts to cope with the inconceivably enormous mass of tuberculous infection in the poultry-yards of extensive areas of our country. We must give all material and moral aid possible to those who are engaged in making tuberculosis a less frequent disease of humans. Not because that for all animals avian and human bacillary types are dangerous at this time. They are so, for some animals and this may merely emphasize the fact that they are tubercle bacilli endowed with the primeval specific power to vary, to adjust their parasitism to new hosts, to survive and to maintain a place in nature.

Not only must we have an eye to heterogenous primary infection sources, but also to homogenous ones, which may have been neglected in our onslaught on the more conspicuous causes.

We cannot completely eradicate tuberculosis from cattle herds if we do not cope with the disease in animals liable to infection by the bovine bacillary strain. Thus, if in a given situation bovine tuberculosis is found, the other animals most liable to this type of infection, such as swine, should not be permitted to remain unchallenged. A hog with any form of open tuberculosis is just as dangerous, as an infection source, as a similarly affected bovine animal.

Now that in many states freedom from bovine tuberculosis is being approached, it is time to look also into another real or potential infection source which, thus far, has been deliberately exempted from any challenge for tuberculosis. At a time when all efforts had to be concentrated against dangerous infection foci, the transient feeder's cattle could perhaps be disregarded with relative impunity. Early in the organized campaign it was, no doubt, good politics not to take in too much territory, but now, when we are beginning to see the conclusions of our principal task, it would be a stupid policy to permit any unchallenged animal to help in the undoing of a work about to be accomplished at an enormous cost. No living source of infection must be neglected. After all, this is what is implied in the term "eradication."
The secondary infection source is the environment in which animals must exist and all that this may include. Food, water and housing are merely environmental details.

It may be said that the secondary infection sources are always the most potent in transmission of the disease, because a direct transference of tuberculous virus from animal to animal is likely to be extremely rare.

The environment is a half-way station for tubercle bacilli, situated between old and new hosts. For so far as its relation to this bacterial species is concerned it is merely an ecologic detail.

From a hygienic point of view the most important phase of the part played by environmental infection sources is connected with the fact that tubercle bacilli may remain viable, even virulent therein, for long periods. There is good reason to believe that a tubercle bacillus may live longer in an environmental situation than in the animal body itself.

How long an environment, such as a yard or stable, may remain active as an infection source is not known. Schalk, of North Dakota, found avian bacilli still active after an existence of two years in the soil, and there is some circumstantial evidence to indicate that the same may be the case in infection of bovine origin.

It must not be thought that the longevity of environmental virus is without limitations. It is, however, not known what these limitations may be. There is some ground for the hypothesis that the organisms in the soil are in the best position to survive.

Even there, they cannot be expected to live on indefinitely and are apt to become extinct after a time. There is ground for the belief that as time goes on the bacilli present in the soil first became attenuated and then lose their virulence altogether.

At a given time they may be harmless although still alive and as long as they are alive we must recognize their antigenic capacity. When taken into the animal, they are so apt to sensitize the latter that a positive tuberculin reaction will become manifest.

We have no experimental evidence upon which to base a positive assertion, but casual observations seem to indicate that environmental infection with bacilli which, partly or wholly, have lost their virulence may account for at least a part of the no-lesion reactors, for the so-called skin lesions containing avirulent bacilli and for the recrudescence of tuberculosis in herds and on farms from which the disease had been carefully eliminated.
Knowledge, empirically acquired, indicates that the eradication of the soil-borne infection of avian tuberculosis by the elimination of reacting fowls only is a futile undertaking. This is not true in bovine tuberculosis, but it cannot be denied that the same factor is apt to play a part in certain cases.

The prolonged viability of tubercle bacilli in soil must be reckoned with. Not only must such contaminated soil be avoided, but the most thorough care must be exercised to prevent the recruiting of the virus stock by the presence of active, primary infection sources—animals.

Even if infected yards cannot be abandoned, the virus will ultimately disappear if animals contracting tuberculosis in such yards be not given time to return a new stock of bacilli to the soil.

Such animals may contribute a large share of the no-lesion reactors, but, nevertheless, a certain percentage of them do constitute the bridge which connects the primary and the secondary infection sources. It is the breaking down of this bridge which is the pivot upon which eradication turns. If we prevent the one source to feed the other, our task would be largely completed.

**THE PATHOGENICITY FOR DOGS OF BACILLI OF AVIAN TUBERCULOSIS**

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The ability of bacilli of tuberculosis of avian origin to incite demonstrable tuberculous lesions in certain mammals is generally recognized. Among the species which may be considered susceptible to infection with the avian type of the bacillus of tuberculosis, either by spontaneous or by artificial means, may be mentioned hogs, horses, cattle, sheep and rabbits. Lucas reported a case of what he considered to be avian tuberculosis in a marsupial, and Stableforth has described a case of spontaneous tuberculosis in a wallaby, which was shown by animal inoculation to have been due to bacilli of avian tuberculosis.
Evidence pertaining to the vulnerability of the dog to bacilli of avian tuberculosis is fragmentary and indefinite. Hericourt and Richet, as early as 1892, observed that dogs and monkeys were very resistant to the bacilli. Van Es believed that while it may be assumed that this animal is not susceptible, the data were insufficient for definite conclusions. Cobbett, commenting on the pathogenicity of the various types of bacilli of tuberculosis for the different animals, stated that under no circumstances does the avian type infect the dog. An examination of the cases of spontaneous tuberculosis in the dog in which typing studies have been done seems to substantiate Cobbett's statement.

Schornagel obtained eight cultures in a study of eleven cases of canine tuberculosis which he typed as follows: Two cultures contained the bovine type, four the human type, and two the transitional type. Panisset and Vego reported two cases in which the organisms were of the human type. Cobbett reviewed seventeen cases in which the type of the infective agent was determined; in seven cases the organisms were of the human type and in ten they were of the bovine type. A case in which the bovine type was demonstrated was reported by Wilson and Lovell. Smith observed one case and Griffith observed three cases of tuberculosis in the dog due to infection with the human type of the organism. Rabinowitsch-Kempner reported a total of nineteen cases of tuberculosis in dogs in which the bacillary types were given as follows: bovine, one; human, sixteen; and atypical, two. In Malm's five cases, the infective organism was of the bovine type. Stableforth has recently added sixteen cases of canine tuberculosis to the literature, in which the organism in ten of the cases was typed as human and in six as bovine. Thus seventy-two cases have been reported in which the bacillary type has been determined. I observed one case of spontaneous tuberculosis in the dog in which the causative organism was of the human variety. Details of this case will be presented later in this report.

Although these data are not intended to be a complete summary of the literature of spontaneous tuberculosis in the dog, they are of considerable value in that the bacillary type of the causative organism was determined. As far as I have been able to ascertain, cases of spontaneous tuberculous infection of the dog have not been described in which the etiologic agent was of the avian variety.
From this summary it is apparent that spontaneous tuberculous infection in the dog is usually the result of one of the mammalian forms of the organism, with the human variety predominating. The intimate association of the animal with tuberculous human beings, in many of the cases reported, may explain the probable origin of many of the cases in which the human form of the bacillus is implicated.

As to the possible reasons for the absence of the avian variety of the organism in those cases of tuberculous infection in the dog, in which typing experiments have been conducted, there are at least two factors worthy of consideration. The first factor is that the majority of cases reported seemed to occur among city dogs, and an urban environment offers only slight possibility for spontaneous infection by the avian type of bacillus. The second and perhaps most important factor is the possession by the dog of sufficient inherent resistance for the avian bacillus of tuberculosis to enable it to avoid spontaneous infection.

In order to obtain information pertaining to the susceptibility of the dog when exposed experimentally to bacilli of avian tuberculosis, a series of apparently normal adult dogs of various breeds was injected intradermally with avian tuberculin, and a negative reaction was obtained. In all, fourteen dogs were inoculated with a heavy suspension of acid-fast bacilli in sodium chlorid solution of acid-fast bacilli prepared from a culture obtained from another laboratory and which were purported to be of avian origin. Inoculations were as follows:

Intravenous, intratracheal, intraperitoneal, intramuscular, subcutaneous, by inhalation, intracerebral (two animals), by ingestion (in milk), into the urinary bladder, into the mammary gland, into the duodenum, into the posterior chamber of the eye, and into the pulp cavities of four teeth. For control purposes, chickens, guinea pigs and rabbits were inoculated with portions of the same suspension. At the termination of the experiment the control animals all failed to reveal demonstrable evidence of tuberculosis. Likewise, in none of the dogs inoculated did the disease develop. Failure of the disease to develop in any of the control animals justified the conclusion that the organism was avirulent.

A new series of experiments was then undertaken in which the dog was injected with bacilli of avian tuberculosis intravenously, intrabronchially, intraperitoneally and intracerebrally. Also, a large number of dogs were exposed to infective material by inges-
tion of tuberculous chicken and swine livers from cases of the disease in these animals. A total of fifty-four apparently normal dogs were used and each was injected intradermally with avian tuberculin before being accepted for the experiment. The reaction was negative in all the dogs.

**EXPOSURE BY INGESTION**

Calmette emphasized the importance of the digestive tract as a portal of entry of tuberculous infections in the following statement:

> In all susceptible animals, man included, tuberculosis in all its various localizations, glandular, pulmonary and so forth, particularly in its slowly evolutive forms, results in an immense majority of cases from an infection which is primarily lymphatic and later of the blood and which originates in the absorption of tubercle bacilli from the digestive tract.

Experimental data have accumulated which would seem to justify Calmette's conclusion, and it seemed a logical approach to the question of the dog's susceptibility to the bacillus of avian tuberculosis to feed dogs diseased livers from chickens that had died of tuberculosis. It was felt that such an experiment should expose the animal in a manner comparable to the natural exposure which would occur if the dog should maliciously kill and eat a bird that might be tuberculous.

A typical tuberculous chicken liver usually contains enormous numbers of bacilli, and it would be reasonable to presume that the consumption of the entire organ would constitute a rather generous exposure. Livers were obtained from spontaneous cases of avian tuberculosis, and, before being fed, a small portion of each was removed and emulsified. For the purpose of demonstrating virulence, a normal chicken was injected intravenously with 1 cc of the emulsion. In every instance these chickens died with extensive lesions of tuberculosis throughout the liver and spleen. Many of the livers and spleens of the chickens used in the virulence test were also used in the feeding experiments.

**Method:** In all, seventy-one tuberculous chicken livers were fed to thirty dogs; twenty-two dogs received one tuberculous chicken liver, two dogs received two, two dogs received three tuberculous chicken livers, and one dog each received four, six, eleven and eighteen tuberculous chicken livers. In addition, three dogs were fed two tuberculous swine livers which were obtained from abattoirs; two of the dogs each received half a tuberculous swine liver, and one dog received an entire liver. The swine livers contained early miliary lesions and the bacilli
of tuberculosis were numerous. The lesions in each case were considered to be due to the avian type of the organism, since rabbits and chickens injected with emulsions of the involved tissues succumbed with the usual picture of experimental tuberculosis in these animals.

Most of the dogs which received the infective material had not eaten during the previous twenty-four hours, and they ate the livers readily. An occasional dog was encountered who refused to eat the liver, but after it was minced with fresh horse meat there was no further hesitancy.

All animals received the regular kennel ration and enjoyed limited exercise during the course of the experiment. The dogs were injected intradermally with avian tuberculin several times during the period of observation but in no instance was a positive reaction obtained.

At the end of one year, eighteen of the thirty-three dogs were still alive; one had been killed after 107 days because of red mange; four others had been killed after variable periods of from 208 to 272 days for necropsy examination, and ten had died at varying periods of from three to 360 days subsequent to the ingestion of the infective material.

Results in animals that died: Ten of the dogs died subsequent to the ingestion of the infective livers at variable periods of from three to 360 days. Among the evident causes of death in these animals might be mentioned intussusception, pneumonia, distemper and accidental death from fighting. In none of these was there demonstrable evidence that death had resulted as a consequence of eating the tuberculous material. Emulsions were prepared from the tissues of several of the animals which died, and injected intravenously into chickens. All of the injected chickens were without tuberculous lesions when killed for necropsy six months later. Consequently it was not possible to demonstrate that the bacilli of avian tuberculosis had contributed to the death of any of the dogs. In one of the ten dogs definite lesions of tuberculosis were observed. The details of this case follow:

A bull terrier, which had been at the laboratory only a short time and whose previous history was unknown, began to lose weight about three months after ingesting the first of four tuberculous chicken livers. The loss of weight was progressive and the animal soon presented a most wretched appearance. Bovine and avian tuberculin were injected intradermally, with negative results. The animal continued to fail and for humane reasons
it was permitted to die in the ether chamber. Necropsy revealed hemorrhagic colitis and an abscessed area about 2 cm. in diameter in the apical lobe of the left lung. The diseased area was cavitated and contained thin, grayish, sticky pus, smears from which were positive for acid-fast organisms similar in appearance to the bacilli of tuberculosis. A portion of the lesion was emulsified and injected into a chicken, a rabbit, a pigeon and a guinea pig. The chicken died twenty-eight days later; it was thin and anemic but without gross or microscopic lesions of tuberculosis. The guinea pig died on the forty-ninth day subsequent to the injection and presented the usual lesions of tuberculosis throughout the spleen, liver and lungs. A chicken injected intravenously with emulsified lung material from the guinea pig was found to be free from lesions when killed for necropsy nine months later. The pigeon and the rabbit were both without gross or microscopic evidence of tuberculosis when necropsy was performed after eleven months. The results of the animal inoculations would seem to justify the conclusion that the organisms responsible for the lesions in this case were of the human type and that the disease was spontaneous and in no way related to the feeding of the tuberculous chicken livers.

Results in animals that lived: The dogs that were living after one year were killed and carefully examined. At the time of the necropsy each animal was in excellent flesh and entirely without gross evidence of tuberculosis. Sections were prepared from the liver and lungs of each animal, and with one possible exception lesions of tuberculosis were absent. The section of the lung of one dog, which had received a tuberculous liver and spleen of a chicken, showed one cellular accumulation of undetermined character which had at least slight resemblance to an early tuberculous focus. However, acid-fast organisms could not be demonstrated in appropriately stained sections. The liver of a dog which was killed 208 days after receiving the first of six chicken livers, revealed a few small definite circumscribed foci of monocytic cells which were strongly suggestive of early tuberculosis. Bacilli of tuberculosis could not be found in the lesions after prolonged search. The dog was a three-months-old puppy at the time the first liver was eaten and was about a month older when the sixth liver was consumed.

To determine whether avian bacilli of tuberculosis could pass through the alimentary tract and remain viable, the following experiments had been done.
**Experiment 1:** From a dog which had been fed five tuberculous chicken livers between the age of three and four months, feces were collected ten days after the fifth liver had been fed. An emulsion was prepared from the fecal material and cultures were attempted for bacilli of tuberculosis. A normal chicken was given an intravenous injection of a portion of the same emulsion. The dog was then fed the entire liver (the sixth) from a case of spontaneous avian tuberculosis. The liver was markedly involved and the lesions possessed enormous numbers of acid-fast bacilli. There was no bowel movement until forty-eight hours later, when some greenish-yellow mucous material was voided. Direct smear of the fecal fluid showed large numbers of acid-fast bacilli. An emulsion was made from which cultures were prepared and a chicken was inoculated.

The attempts to culture the feces obtained prior to feeding the sixth tuberculous liver were all negative, whereas vigorous growths were obtained in all tubes inoculated with the fecal material secured after the ingestion of the diseased liver. Likewise, the chicken which was given an injection prior to the meal of liver was found to be free of disease when killed for necropsy five months later; the liver and spleen of the chicken which received the injection of the fecal material, voided after the ingestion of the tuberculous liver, were strikingly affected. The chicken died 153 days after the injection.

**Experiment 2:** Two dogs were each fed half of the liver of a chicken which had died subsequent to the intravenous injection of an emulsion of a tuberculous swine liver. Fecal smears made before the ingestion of the infective material were negative for acid-fast bacteria. Food was withheld for three days after the livers were eaten, and since bowel movement did not occur the dogs were finally fed, and on the fourth day normal-appearing feces were voided. Two to three grams of feces from each dog were emulsified in sodium chlorid solution and smears were prepared in which numerous acid-fast bacilli could be demonstrated. From each fecal mixture cultures were attempted and one chicken was inoculated intravenously. Pure cultures of bacilli of tuberculosis were obtained and the chickens died fifty-five and sixty-two days, respectively, after they were inoculated. Typical lesions of tuberculosis were present throughout the livers and spleens of both chickens.

**Comment:** These experiments substantiate the observations of Zagari, Strauss and Wurtz that bacilli of tuberculosis are not
affected by gastric juice after an exposure of three to four hours at 30° C. Zagari also found that dog feces contained virulent bacilli after the animal had been fed sputum from patients with tuberculosis, and Cadéac and Bourney demonstrated bacilli of tuberculosis, which were virulent for rabbits, in the feces of a cow which had been fed tuberculous material.

**Intraperitoneal Injection**

Two animals were given an intraperitoneal injection of material prepared from two different cases of spontaneous avian tuberculosis. Enormous numbers of bacilli of tuberculosis were present in the direct smears from the livers used to prepare the emulsions which were injected. One dog received 3 cc of the emulsion, and the other received 5 cc. Both dogs were killed after one year. Sections from the liver and lungs of both dogs were examined, and in none were there any morphologic alterations.

**Intrabronchial Injection**

Each of three dogs was given an intrabronchial injection of 5 cc of a suspension of bacilli of avian tuberculosis. The injections were made with the aid of a bronchoscope, with the animals under light ether anesthesia. The suspension used consisted of bacilli of tuberculosis of avian origin in sterile sodium chloride solution and had a density comparable to that of tube 9 of the McFarland nephelometer.

For control purposes, six tuberculin-tested adult hens were injected intravenously with portions of the same suspension used to inoculate the dogs. The hens all died in fifteen to forty-five days subsequent to the injection, and extensive lesions of tuberculosis were demonstrated in each hen.

Daily, except Sunday, temperatures of the dogs were taken for the first ninety days of the experiment and, with the exception of one animal, the temperature remained practically normal throughout the period of observation. Slight fever developed in this dog on the seventh day after the bacterial suspension was introduced. The temperature rose to 105° F. but gradually receded to normal within a week. The animals failed to react to avian tuberculin administered intradermally on several occasions.

The animals remained apparently normal throughout the entire period of the experiment. They were killed after 141, 239 and 247 days, respectively. Careful examination of the tissues
at necropsy failed to disclose gross evidence of disease. The histologic study of the liver and lungs was also negative as far as demonstrable lesions of tuberculosis were concerned.

**INTRAVENOUS INJECTION**

In ten dogs bacilli of avian tuberculosis were injected by way of the jugular vein. Emulsion of tuberculous chicken liver was given to three dogs, emulsion of tuberculous chicken liver and spleen to four dogs, and suspension of bacilli to three dogs.

The emulsions used were prepared from livers and spleens of chickens which had died as a consequence of tuberculous infection, and in every instance the injected material contained enormous numbers of bacilli of tuberculosis. The suspensions used were prepared from different strains of the bacilli which had been isolated from spontaneous cases of avian tuberculosis and were known to be pathogenic for rabbits and chickens but not for guinea pigs. The suspensions purposely were made heavy and were comparable with tube 9 of the McFarland nephelometer. The virulence of the various inoculums was further demonstrated by giving chickens injections of portions of the same material used to inject the dogs. All of these chickens died with extensive lesions of tuberculosis within one to two months.

The temperatures of the dogs in this experiment were taken every second day over a period of three months subsequent to the injection, but nothing of significance was recorded. The general condition of the animals remained excellent throughout the period of observation, and in none was it possible to obtain a positive reaction following the intradermal injection of avian tuberculin.

Of the ten dogs in this series, only one dog died spontaneously; the others were killed for necropsy over a period of 100 days to a year after the injection. The dog which died spontaneously had received 3.5 cc of emulsion of tuberculous liver, and died 323 days after the injection, of causes which were undetermined; tuberculous lesions were not present. Gross or microscopic evidence of tuberculous changes could not be found at necropsy in two dogs that had each received 3 cc of emulsion of tuberculous liver and were killed after one year, in two dogs that had each received 5 cc of emulsion of liver and spleen and were killed after 214 days, or in one dog that had received 10 cc of emulsion of liver and spleen and was killed after 213 days. Sections from the
lungs and liver were prepared from each dog at necropsy. Sections of the livers of three dogs revealed a few morphologic reactions which were similar in many respects to tuberculous lesions. One of these dogs had received 10 cc of emulsion of tuberculous liver and spleen and was killed after 216 days. The two other dogs had received 4 and 8 cc, respectively, of suspension of bacilli of tuberculosis and were killed after 251 and 100 days. Acid-fast organisms could not be demonstrated in sections appropriately stained, and as a consequence the exact nature of the lesions is more or less indefinite. The liver of one dog that had received 8 cc of suspension of bacilli of tuberculosis and was killed after 100 days, possessed numerous accumulations of monocytic cells not unlike early tuberculous reactions. The majority of these seemed to have had their inception in the connective tissue of the portal canals and much of the connective tissue of the part was replaced by the monocytic cells of the lesions. A few masses of cells of a similar nature occurred promiscuously among the hepatic cells of the respective lobules, although these were for the most part of smaller dimensions than the lesions which occupied the portal canals. A few acid-fast bacilli were demonstrated among the reacting cells.

Emulsions were prepared from the livers of the two dogs which had received 8 cc of bacterial suspension and cultures were attempted, with negative results. From portions of each emulsion one chicken and one rabbit were inoculated intravenously. These animals were killed for necropsy after a lapse of 100 days and the only demonstrable lesions of tuberculosis observed occurred in the liver and spleen of the chicken which had been injected with the emulsion prepared from the dog's liver which revealed positive histologic evidence of the disease.

The results obtained in the foregoing experiment would tend to show that the dog is very resistant to bacilli of avian tuberculosis when the infective material is introduced into the jugular vein, and although infection may occur it is seldom of a progressive character and is apparently limited to the liver.

In order to ascertain whether or not bacilli of tuberculosis injected intravenously might be eliminated by the kidneys, two dogs were catheterized just prior to the intravenous injection of 8 cc of a suspension of bacilli of avian tuberculosis. Ten cubic centimeters of each specimen of the urine obtained was centrifuged, and the lower 0.5 cc was mixed with an equal amount of sterile sodium chlorid solution and injected intravenously into a
tuberculin-tested chicken. The dogs were again catheterized, four hours subsequent to the bacterial injection, and the centrifuged precipitate from 10 cc was examined for bacilli of tuberculosis. That from one dog was negative; that from the other revealed many small diplococci or streptococci, and after prolonged search one acid-fast bacillus was found. The animals had not voided urine at the twentieth hour following the introduction of the bacterial suspension and were catheterized again. The centrifuged precipitates obtained from the two specimens of urine from each dog were mixed and injected intravenously into two tuberculin-tested chickens. After 93 days the two chickens were killed for necropsy. The control chickens, which had been injected with the urine obtained before the dogs had received the intravenous injection of the bacilli, were killed, and at necropsy were found to be perfectly normal in every way. The chicken injected with the urine of one of the dogs subsequent to the injection in the bacilli was likewise normal, whereas the chicken which received urine from the other dog presented lesions of tuberculosis throughout the liver and spleen.

The passage of bacilli of tuberculosis through the kidney of one of the dogs appears to have been demonstrated.

**Intracerebral Injection**

Three different strains of bacilli of avian tuberculosis were used to inoculate six dogs intracerebrally. Each of these strains was isolated from the liver of a spontaneous case of avian tuberculosis and was of proved virulence for rabbits and chickens when injected intravenously, but not for guinea pigs when injected subcutaneously. The bacterial suspensions used were prepared from organisms grown on egg or potato media and suspended in sterile sodium chloride solution. The suspensions were standardized—approximately to tube 9 of the McFarland nephelometer. One cubic centimeter of the suspension was used in each case.

The animals were injected under general anesthesia. The cranium was exposed over the median-lateral portion of the left cerebral hemisphere and the bone was carefully perforated with a small hand-drill carrying a bit one thirty-second of an inch in diameter. The infective material was then introduced deep into the cerebral substance, with a syringe fitted with a 20-gauge needle 1.5 inches in length. Strict asepsis was observed throughout the procedure (table I).
The animals usually recovered from the effects of the operative procedure within three to four days. They ate and drank as usual and presented a fairly normal appearance for the first ten days to two weeks, when some of them gradually became irritable and resented undue handling. During the last three to six days before death the animals were unable to stand; they became comatose and finally moribund.

The temperatures of the respective animals which were given intracerebral injections were recorded each day. After an initial rise of 2 to 3 degrees, which persisted for forty-eight to seventy-two hours post-operatively, the temperature remained fairly constant between 101 and 102°F. A day or so before death, in a few instances, the temperature dropped several degrees, in one case to 86°F. None of the animals reacted to avian tuberculin injected intradermally. The dogs died after seventeen, eighteen, twenty-three, twenty-four, twenty-eight and twenty-nine days, respectively. Lesions of the brain and liver were found in all six dogs, and lesions of the spleen were found in one dog.

The recognition of a tuberculous process macroscopically was not possible in any of the tissues. The dura mater, in a few instances, was somewhat adherent to the overlying bone in the region of the operative perforation, and the meninges were without exception in a state of congestion; but definite tissue changes of a specific tuberculous character were not discernible with the naked eye. Even the liver, which possessed in many instances innumerable lesions, was without gross alterations.

In every instance smears made from the cerebral surface of the brain of the animals which were given intracerebral injections revealed typical acid-fast bacilli when stained with carbol-fuchsin.

In two of the animals, cultures were attempted from the brain, and a pure culture of the bacillus of tuberculosis was obtained in each instance. The livers of two dogs also were cultured, and the bacilli were obtained from each.

The lesions in the brain appeared to have their inception in the perivascular areas of the pia mater. They extended into the sulci as a diffuse collection of monocytic cells, many of which phagocytosed variable numbers of bacilli of tuberculosis. In the substance of the cerebrum the lesions were limited in their initial appearance to the perivascular areas of the blood-vessels. Some of the lesions coalesced and created a large proliferative focus of
monocytic cells, among which mitotic division was sometimes seen. Necrosis of a caseous nature occasionally ensued, but in none of the material was calcification observed. The usual tubercle did not occur and tuberculous giant cells were likewise absent. At the relatively early stage in which the reaction was observed the lesions consisted essentially of diffuse, proliferative collections of monocytic cells quite dissimilar from the typical tubercle which characterizes the usual pathologic histology of tuberculosis.

The lesions of the liver in the respective cases varied in degree from extensive multiple foci distributed promiscuously throughout the substance of the liver to that in which only an occasional focus of monocytic cells was to be seen. As far as could be determined, the lesions had their inception in the walls of the sinusoids. The lesions consisted of compact accumulations of monocytic cells of the same character as those constituting the tissue reaction in the brain. The lesions were, generally speaking, spherical in contour, and intact capillaries persisted in many of them. In many of the lesions mitotic division of the monocytic cells could be seen. Bacilli of tuberculosis were exceedingly difficult to demonstrate in the lesions, even in those instances in which the lesions were numerous and the reactive process excessively vigorous. That the bacilli were present was evidenced, however, by the facts that they were successfully cultured from the emulsified tissue and that an occasional organism was found in some of the histologic preparations. Tuberculous giant-cells were not seen. Retrogressive tendencies such as necrosis or calcification were not apparent in the lesions.

In one of the dogs a few small monocytic proliferations were manifest in the spleen. These were limited to the splenic corpuscles, and bacilli of tuberculosis could be easily seen among the monocytic cells. The spleens of the other dogs which were given intracerebral injections were devoid of demonstrable lesions.

Although in many of the cases the lungs showed early pneumonia with edema and congestion, in no instance was a tuberculous reaction observed. Likewise, the other organs, such as the pancreas, prostate gland, kidney, and thyroid gland, escaped tuberculous involvement.

In one dog the spinal cord was examined for histologic evidence of tuberculosis. Although the cord was normal in the sacral, lumbar and thoracic portions, sections from the cervical portion revealed definite meningitis of a mononuclear character
over about half the circumference of the cord. The cord proper
showed degenerative changes which could not be identified as of
a tuberculous nature. Among the monocytic cells of the menin-
geal reaction a very few bacilli of tuberculosis were present.

**COMMENT**

The control and eventual eradication of avian tuberculosis
constitutes a problem of tremendous magnitude, and before the
disease can be banished from poultry flocks all pertinent facts
concerning its transmission and the pathogenicity of the causa-
tive organism must be fully understood. The general prevalence
of the dog as part of the live stock population of American
farms and the unrestricted range usually permitted these animals
suggest circumstances which might well result in an occasional
infection of the dog by the avian form of the organism. The
possibility of the dog being a disseminator of the infection is also
apparent for the same reasons.

The failure to find in the literature consulted a single instance
of canine tuberculosis in which it was shown by proper typing
methods that the organism was of avian origin seems of consider-
able significance as far as the susceptibility of the dog to natural
infection by this organism is concerned. The great majority of
cases of canine tuberculosis reported have been diagnosed on the
pathologic changes presented and the finding in smears of acid-
fast bacilli. In only a relatively small percentage of the cases
have the organisms been typed by animal inoculations. Since
the bacillary type has been determined in such a few cases, it is
possible that an occasional case may have occurred in which the
avian form of the organism was responsible, but that this is very
unlikely seems to be indicated by the results of the attempts in
this study to induce the disease by the feeding of tissues con-
taining large numbers of the infective agent. One would expect
spontaneous tuberculosis in the dog, if it occurs at all from the
avian bacillus, to have its inception from the alimentary canal
following the ingestion of tuberculous chicken viscera or other
infective material. This route of infection has been shown to
produce tuberculosis by many investigators, a few of which may
be mentioned.

Ravenel was able to demonstrate, by guinea pig inoculation,
the presence of bacilli of tuberculosis of the bovine type in the
chyle of dogs killed a few hours after the ingestion of the organ-
isms. He concluded that under certain conditions the bacilli may
pass through the normal intestinal mucosa with ease and rapidity without necessarily inducing a tuberculous lesion at the point of penetration. As further proof of the permeability of the intestinal mucosa for the bacillus of tuberculosis, Ravenel and Reichel mentioned the observations of Ostertag. In 1,000 tuberculous swine which were considered to be infected by ingestion, the lymph-nodes of the throat, neck and mesentery were tuberculous, while the intestinal mucosa was without demonstrable evidence of the disease. In another experiment Ravenel and Reichel caused the infection of a series of guinea pigs by injecting bacilli of tuberculosis directly into the stomach with a syringe. In 56 per cent of the animals the bacilli reached the lungs within twenty-four hours after inoculation, although in ten control animals lesions of such a nature eventually developed, so an element of doubt was introduced as to the accuracy of the method employed. In this experiment it is probable that the infection occurred not only by way of the intestinal mucosa but also directly through the wound in the stomach through which the injection was made.

Calmette and Guérin demonstrated that the artificial infection of animals could be accomplished by feeding when the organisms were suspended in an emulsion of egg-yolk or beef-bile. The resultant infection failed to incite lesions in the intestinal wall, thus confirming the observations of Dobroklonski and others that tuberculous infection may result from the passage of the organisms through the mu cosa of the intestine without the production of a lesion in the bowel.

Mohler and Washburn were able to show that in hogs fed with infected tissue from chickens that had died of spontaneous tuberculosis, well defined lesions of tuberculosis would develop in the various tissues of the abdomen such as the mesenteric lymph-nodes, the liver and the spleen. Van Es emphasized the importance of the alimentary canal as a portal of entry of tuberculous infection in swine and directed particular attention to the great necessity of preventing contamination of feed and watering-troughs, as well as the soil of hog-lots by tuberculous chickens. He insisted on the most thorough separation of swine and poultry when these animals are maintained on the same premises, if swine tuberculosis of avian origin is to be eliminated.

Thus there seem to be sufficient data to warrant Calmette's contention that "the path of digestive absorption is one of those which is open to the exterior and which offers itself most fre-
quentily and most readily to the penetration of the virus into the body." This route of infection, as far as the susceptibility of the dog for the bacillus of avian tuberculosis is concerned, would seem negligible if the results of the experiments in this study are considered as dependable criteria. Although thirty-three dogs were fed a total of seventy-one tuberculous chicken livers and two entire tuberculous swine livers, definitely frank lesions of tuberculosis failed to develop, although in the liver of a puppy a few lesions suggestive of a tuberculous reaction were present. Even the feeding to one dog of eighteen livers which contained enormous numbers of bacilli of avian tuberculosis of proved virulence failed to incite the slightest change which could be demonstrated either grossly or microscopically.

The observation that viable bacilli of tuberculosis can pass through the intestines of the dog following the ingestion of a tuberculous chicken liver would seem of some significance in formulating measures to prevent the dissemination of the infection. The devouring of a tuberculous chicken by a marauding dog might well accomplish the spread of the infection over considerable territory through the voiding of feces containing the organisms. Chickens should therefore be protected from depredations of dogs by suitable enclosures and such attacks should be made less possible by the enforcement of proper measures to curb the activities of wandering outlaw animals.

Although the number of dogs given an intrabronchial injection was relatively small, the results would seem to justify the conclusion that the dog is extremely resistant to virulent bacilli of avian tuberculosis when the organisms are brought into intimate contact with the tissue of the lung. The dosage was sufficiently large to insure massive exposure to a part of the body usually readily susceptible to tuberculous infection by the mammalian types of the bacillus. The fact that lesions did not develop demonstrates the capacity of the tissues of the lung of the dog successfully to inhibit the activities of bacilli of tuberculosis of avian origin; although, as Davis has shown, when the human type of the bacillus is introduced intrabronchially in dogs, extensive pulmonary lesions of tuberculosis develop.

The intravenous introduction of virulent bacilli of tuberculosis usually results in susceptible animals in a generous distribution of lesions throughout the lungs and liver. Marked lesions invariably develop in rabbits and chickens when the avian bacillus is injected intravenously, and Corper and Lurie have shown that
the dog can be infected with the human form of the organism by the same procedure.

The failure to obtain well-defined lesions of tuberculosis in most of the dogs in this study which were given an intravenous injection, indicates rather forcibly the amount of natural resistance possessed by this animal for bacilli of tuberculosis of avian origin. That the dog's susceptibility differs from the various bacillary types is illustrated by the following: A dog which received, intravenously, 4.0 cc of suspension in sodium chlorid solution of virulent bacilli of avian tuberculosis was killed 251 days later and only a few foci of a possible tuberculous character could be found in the liver. The lungs were normal. Another animal of comparable age and weight which received on the same day an equal dosage of bacilli of tuberculosis from a patient with tuberculosis died seventy-two days later with extensive lesions of tuberculosis throughout the liver and lungs.

From the results obtained following the attempts to produce tuberculosis in the dog by the intravenous injection of bacilli of avian tuberculosis, it would seem proper to state that if an excessively large dosage is employed tuberculous lesions may develop in the liver. The lesions, however, are inclined to be only slightly progressive and eventually to become quiescent or actually atrophic. In time, the majority would no doubt disappear. When large numbers of the avian variety of the organism are released into the blood-stream, the protective mechanism seems to be inadequate and enough bacteria survive to incite a reaction which usually proves capable eventually of subduing the infection. Even in those instances in which lesions are initiated in the liver the bacilli are usually extremely few, and in no way compare with the large numbers present in lesions in the same organ when due to the human type of the bacillus.

The results of the intracerebral inoculation\(^9\) make it evident that although the dog may be very resistant to the bacillus of avian tuberculosis by the ordinary routes of inoculation, when the infective material is placed within the substance of the brain, little resistance is encountered and rapidly fatal tuberculosis invariably ensues. Dogs injected in this manner succumbed before the chickens which were injected intravenously at the same time with portions of the same inoculum.

The production of experimental tuberculosis by introducing the organisms directly into the brain was accomplished by Manwaring, in 1912, in an attempt to determine the therapeutic value
of leukocytes in tuberculous meningitis. The bovine and human types of the organism were used and considerable variance in the duration of the disease was noted, which Manwaring attributed to the virulence of the cultures. With the virulent bovine strains the disease was usually rapidly fatal, whereas with the less virulent human strains the incubation period was prolonged and an occasional animal recovered.

Kasahara, working with bovine, human and avian types of the bacillus of tuberculosis, was able to produce fatal tuberculous meningitis in rabbits by introducing the organisms into the subarachnoid space by an atlanto-occipital injection. More recently, Shope and Lewis, in studying a paralytic disease in tuberculous guinea pigs, successfully perpetuated the infection through nine successive animal passages by giving normal guinea pigs intracerebral injections of emulsions of the brains of animals that gave evidence of the disease. The injections invariably resulted in a fatal infection and at no time did the animal show a febrile reaction. This is in keeping with the temperatures obtained from the dogs in my series which were given intracerebral injections. Apparently, in animals experimental tuberculous infection of the brain and its meninges is not productive of a febrile disturbance.

The failure to obtain positive tuberculin reactions in any of the dogs of this study, which were eventually found to possess lesions of tuberculosis, is difficult to explain. The tuberculin used was prepared from the bacilli of avian tuberculosis by a reputable concern and was capable of inciting a characteristic reaction in the wattles of tuberculous chickens. This phase of the project seems worthy of more exhaustive study.

SUMMARY AND CONCLUSIONS

Although the avian type of the bacillus of tuberculosis has been identified as the etiologic agent in spontaneous cases of tuberculosis in many of the common domesticated mammals, a case of tuberculous infection in the dog, due to the avian form of the organism, has not been found in the literature reviewed. Seventy-two cases of canine tuberculosis in which the causative organism was typed have been reviewed and one original case is presented. These cases are distributed among the three bacillary types of the bacillus of tuberculosis as follows: bovine, twenty-five; human, forty-four; atypical, four, and avian, none. The failure to find in the literature spontaneous cases of canine tuberculosis in which the avian type of the bacillus was the infective
agent constitutes presumptive evidence that the dog possesses a greater degree of inherent resistance to the avian type of the organism than to the bovine and human forms.

In a series of experiments undertaken to determine the pathogenicity for the dog of the bacillus of avian tuberculosis certain facts seem apparent:

1. The ingestion of variable amounts of tuberculous liver and splenic tissue obtained from chickens and swine failed to produce lesions of the disease in twenty-one of the thirty-three dogs used. In two of the animals a few microscopic lesions suggestive of a tuberculous reaction were present.

2. Bacilli of avian tuberculosis, when ingested with diseased viscera, may pass through the alimentary canal of the dog in a viable state, with the retention of sufficient virulence to produce tuberculosis in chickens.

3. Dogs exposed to virulent bacilli of avian tuberculosis intraperitoneally and intrabronchially failed to show demonstrable evidence of tuberculosis.

4. In a series of ten animals which were given an intravenous injection of variable quantities of infective material, four presented lesions of the liver of a probable tuberculous character. In one of these dogs the lesions were numerous and fairly characteristic, and bacilli of tuberculosis were observed.

5. In one dog which was given an intravenous injection of bacilli of avian tuberculosis, the elimination of some of the organisms through the kidney was demonstrated.

6. Six dogs which were given an intracerebral injection of bacilli of avian tuberculosis succumbed in from seventeen to twenty-nine days. In each dog there had developed a marked

**Table I—Summary of results of intracerebral injection***

<table>
<thead>
<tr>
<th>Dog</th>
<th>Death (Days after Injection)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29</td>
<td>Tuberculous lesions in brain, and liver</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>Tuberculous lesions in brain, liver and spleen</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>Tuberculous lesions in brain and liver</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>Tuberculous lesions in brain and liver; cultures obtained from brain and liver</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>Tuberculous lesions in brain and liver; cultures obtained from brain</td>
</tr>
<tr>
<td>6</td>
<td>23</td>
<td>Tuberculous lesions in brain and liver</td>
</tr>
</tbody>
</table>

*Each dog received 1 cc of suspension of bacilli of avian tuberculosis.*
tuberculous reaction in the brain and liver, although in no instance were the lungs affected.

The facts obtained from these experiments seem to warrant the conclusion that by the ordinary means of exposure the dog is extremely resistant to the bacilli of avian tuberculosis. When large numbers of the organisms are introduced intravenously, infection may occasionally ensue. Organisms injected directly into the cerebral substance initiate a rapidly fulminating type of the disease with definite tuberculous lesions in the brain and liver. With the exception of the lesions resulting from the intracerebral route of inoculation, the lesions induced by the bacillus of avian tuberculosis in dogs were for the most part of a quiescent nature and lacked the destructive aggressiveness which usually characterizes the activities of this organism in less resistant species.

BIBLIOGRAPHY

1Cadac and Bourney: Quoted by Rutyna and Marek
4Cobett, Louis: The role of the three types of tubercle bacilli in human and animal tuberculosis. Lancet, i (1922), pp. 979-983.
7Davis, J. D.: Unpublished data.
16M.Fadyane: Quoted by Waton and Heath.
17Malm: Quoted by Griffith.
24Schornage: Quoted by Panisset and Verge.
COMMITTEE ON TUBERCULOSIS

419


Zagari: Quoted by Hutyra and Marek.

Zagari, Strauss and Wurtz: Quoted by Hutyra and Marek.

DISCUSSION

Dr. E. A. Watson: I would like to know how long after ingestion of these livers were the dogs found to be excreting viable bacilli.

Dr. Feldman: We attempted to determine it in only one dog. I think at the end of a week there were no more. We did not, however, get a bowel movement in any of these dogs under forty-eight hours—in some it was four days—and yet even after that long retention they were viable.

Dr. Watson: It might be interesting to quote an experiment by one of my co-workers, Dr. C. A. Mitchell, who injected a cow with avian tubercle bacilli, and seven months later found avian tubercle bacilli being excreted from the udder. He took the udder of that cow off, inoculated chickens from it and got a pure culture of avian tubercle bacilli.

I may be out of order, but in connection with the papers by Dr. Van Es and Dr. Feldman, I might report three strains, isolated by my co-worker, Dr. C. A. Mitchell. Possibly some of these gentlemen can tell me whether they are avian, human or bovine.

Strain 3947 infected a cow, causing death; natural infection. Lesions were found in a mesenteric gland. These were of enormous size and did not resemble the caseous lesions found. Guinea pigs and chickens were infected. In rabbits, only local lesions were produced. Infected animals are sensitive to avian tuberculin, and the strain itself produces avian tuberculin.

Strain 8752 was obtained from a skin lesion of a cow. It infects rabbits, guinea pigs and also chickens. In chickens it takes approximately one year to produce lesions, and these lesions are the progressive pulmonary type. No lesions have so far been found in the livers. The strain produces mammalian tuberculin.

Strain 8885, also from the skin lesions of a cow, produces mild infection in rabbits but kills a chicken in 378 days, producing, again, only the pulmonary type of lesion. The organism grows rapidly and produces mammalian tuberculin.

President Lamb: Are there any further remarks or questions? If not, we will proceed with the report of the Committee on Tuberculosis, by Dr. M. Jacob, of Knoxville, Tennessee.

Dr. Jacob: I may state first that the recommendations which are offered are subject to approval by the United States Bureau of Animal Industry.

Dr. Jacob read the four recommendations separately and moved the adoption of each one. The separate motions were duly seconded and carried.

REPORT OF COMMITTEE ON TUBERCULOSIS

Dr. M. Jacob, Chairman, Knoxville, Tenn.

Dr. C. E. Cotton, St. Paul, Minn. Dr. A. E. Wight, Washington, D. C.
Dr. George Hilton, Ottawa, Ont. Dr. Cecil Eldor, Laramie, Wyo.

1. It is recommended to amend paragraph 2, part 1, "Individual Accredited Herd Plan," by inserting a comma after the word "test" in the last line of section c; then, add the words, "or by the 'double injection' method of the intradermic test (meaning the intradermic injection of the caudal fold and vulva)," the amended section to read as follows:

"A herd in which reactors have been found by a preceding test shall not be accredited except, when the final or accrediting test has been made by a combination of either the subcutaneous and ophthalmic tests; by a combination of the intradermic and ophthalmic tests, or by the 'double injection' method of the intradermic test (meaning the intradermic injection of the caudal fold and vulva)."

. . .
2. Paragraph 2 of Regulation 7 of B. A. I. Order 309 (last paragraph) reads as follows:

"Provided further, that, if 25 per cent or more of any lot of cattle tuberculin-tested react, the remainder shall not be shipped interstate without a proper retest, except for immediate slaughter. And provided further, that all cattle not identified by registration name and number shall be identified by metal ear-tag."

It is recommended that this regulation be changed, requiring that, if 10 per cent of any lot of cattle react, the remainder shall not be shipped interstate without a proper retest, except for immediate slaughter.

3. The following is offered as a resolution:

WHEREAS, The efficiency of tuberculin tests depends so much on careful technic, including proper cleansing of the site of injection and sterilization of instruments, be it, therefore,

Resolved, That this Association again go on record as emphasizing its importance as a means of lessening possible errors in the interpretation of the tuberculin test.

4. The Committee also desires to call attention again to a recommendation adopted by this Association during the meeting of 1928, which calls for an amendment to the Modified Accredited Free Area Plan to become effective on or before July 1, 1931, requiring that all feeder cattle, including steers, bulls and females, be permitted to move into Modified Accredited Free Area only under the same provisions that are now required for dairy and breeding cattle.

DR. JACOB: It should be understood that the double injection is not mandatory. It amply makes it possible for the cooperating agencies to use it if they so desire, and it will receive official recognition.

The resolution is simply to offset occasional criticisms that we hear, of faulty technic or carelessness on the part of the operator.

The last is simply to give you something to think about during the next year.

PRESIDENT LAMB: You have heard the report of the Committee on Tuberculosis. What will you do with it?

Upon motion regularly made, seconded and carried, the report of the Committee on Tuberculosis was adopted.

The meeting adjourned at 4:35 p.m.

ADJOURNMENT

FRIDAY MORNING, DECEMBER 6, 1929

The fifth session convened at 9:30 a.m., President Lamb presiding.

PRESIDENT LAMB: We are to be favored this morning with "Clinical Aspects of Human and Animal Rabies," illustrated by moving-picture films, by Dr. Julius H. Hess, of the University of Illinois. I have great pleasure in introducing Dr. Hess. (Applause)

CLINICAL ASPECTS OF HUMAN AND ANIMAL RABIES

By JULIUS H. HESS, Chicago, Ill.

Professor of Pediatrics, College of Medicine, University of Illinois

MR. PRESIDENT AND MEMBERS:

If I may, I will just make a few preliminary remarks before showing the films. The films are largely self-explanatory.

Rabies is a disease that has been known for a long time. Aristotle first described the disease in animals. Aristotle was born in 384 B.C., so, from our standpoint, it has been known, at
least among animals, for a long time. In his description he made
the following statement:

Dogs suffer from madness. It throws them into a state of fury and all
animals which are then bitten are also attacked with madness, with the
exception of man.

In other words, Aristotle classifies us as among the animals.
It is rather surprising that many of the men who have had large
experience in practice have not seen an active case of rabies in
the human. Various figures give the susceptibility in humans,
anywhere from 5 to as high as 50 per cent. It is thought that
15 is a fairly good average of susceptibility among the human
race; in other words, 85 per cent of the human race can be bitten
by a rabid animal and not develop the disease.

**DOG MOST IMPORTANT SPREADER**

Dogs are supposed to be susceptible to the extent of 50 per
cent. Of course, those are all relative estimates. All warm-
blooded animals are subject to rabies. Ninety per cent of the
cases in the human follow dog-bites, and that probably is due to
the close association between the dog and the human. Cats are
even more dangerous to the human than are dogs. The same is
true of wolves and coyotes, due to the fact that the teeth pene-
trate more deeply and leave lesser, let us say, avenues of ventila-
tion, the wound being much sharper and much smaller at the
point of entrance than with that of a larger tooth.

In India the disease is spread largely by jackals. Cattle can
spread the disease. Hogs can spread it, goats and sheep as well,
but that is rarely the case because the wound made by the teeth
of these animals is rather a superficial one, it is more of a grind-
ing; that is, when they set the teeth they grind rather than
puncture, as do the canines. As far as I know, no case has ever
been described as following the taking of cow's milk or the flesh
of any of these animals.

The saliva is probably the only source of infection in the
human. It does not, however, necessarily take one of these deep,
punctured wounds. A superficial abrasion may become infected.
As I say, that is the exceptional way.

The saliva of the animal is infectious on an average of about
seven days before he shows symptoms of the disease, and therein
lies one of the greatest dangers. There is no way of diagnosing
the disease in the live animal until he shows evidence of rabies,
except by the inoculation of the saliva in some of the brain tissues
or central nervous system tissues of some laboratory animal,
preferably a rabbit. But, of course, none of us would think of doing that with a house dog or pet that had not shown any active signs of the disease. Then, when this disease starts out, it is like many other diseases, you do not interpret it as rabies, you simply say the dog is "a little off color" today, and let it go at that. So that seven days before he shows active symptoms, he may be very dangerous to those with whom he comes in contact.

We are in the habit of talking about "dog days." Rabies can manifest itself at any time of the year. In fact, the German statistics of the last few years show that it has been more prevalent in colder seasons than in the summer months or the heat of the summer. However, in the summer, animals run more freely; they show the effects of temperature. We know that in the human, with other illnesses, excessive fatigue and extreme heat all precipitate the disease.

**Many Factors Influence Immunity and Susceptibility**

Knowing as we do that the incubation period may be long, one can see that an individual, who had developed a very considerable degree of immunity to the disease, may not manifest it at all if he can gradually increase the immunity, but if something comes along and depresses him—and the heat of the summer may be thought to be one, as in children, we know from our experience that that is true, that overclothing the children is just as had as giving them bad milk, let us say—he can thereby develop the disease, where he might have had a low degree of susceptibility. That is probably one reason why we speak of the summer as being the season in which we see the most cases, and, secondly, the fact that the dog suffers from the same things that the human does. At the same time, he is running about more. If a dog happens to be in the neighborhood and has rabies, even in the earlier stages, he can infect a very great many other animals which may be on the street at the same time.

The incubation period is stated to be varied by different authors. Some say it is as short as seven to eight days. Most men agree that twelve days is a short incubation period. Thirteen per cent of all the cases collected have shown an incubation period between thirteen and twenty days; 40 per cent between 20 and 40; 25 per cent between 40 and 60, and 3.8 per cent over 200 days. Some of them have been reported as having incubation periods as long as two years.
The nearer the bite is to the central nervous system, the more rapidly is it disseminated. You know it is supposedly disseminated along the nerve sheaths to the brain by the lymphatics. A face bite is the most dangerous of injuries as a whole. That is due to two reasons: First, you are near the central nervous system and your lymphatics have a shorter route; second, the face bites are usually pretty deep, and the virus is buried in the soft tissues and it is not accessible to the antiseptics that you use. What is more, we all know that to treat a wound properly, it should be excised. We should cut out any infected part or any suspicious part and remove it from the body. You hesitate to do that on the face because of the resulting scar. There is always some doubt as to whether it was at all necessary, whether you were dealing with a mad dog.

There are three stages, the prodromal stage, the stage of excitement and the exit. The prodromal stage lasts three or four days, whether that be a 12-day case or 200-day case. The prodromal symptoms which the individual manifests are the usual signs we see at the beginning of any acute infectious disease: restlessness, temperature, more or less excitement, disagreement with everything that surrounds him.

**The Stage of Excitement**

Then comes the stage of excitement, and that usually lasts, on an average, two or three days. It may run as long as six to eight days. During that time the child manifests all of the external manifestations of irritation of the central nervous system to the point of convulsions and cardiac or respiratory paralysis. It is peculiarly true of children that a good many of them pass from the prodromal stage into the stage of paralysis without these two or three days of the excitement stage. One might say these manifestations are overlooked, and then the child goes from the prodromal stage to the paralytic stage and dies suddenly. Usually the paralytic stage lasts only eight to twenty-four hours. That is peculiarly true, as I say, of children.

Now the treatment: As I have said, 90 per cent of the human cases come from dog-bites. I think the question of prophylaxis is best illustrated by what happened in England. England had a great many cases of rabies, and in 1890 a law was passed that every dog must be kept muzzled, and between 1890 and 1895 there were practically no cases of rabies in England. Then some of the ladies did not like their lap dogs muzzled, so they unmuzzled
them, and by 1910 it was quite a prevalent disease again. Then they clamped down the lid and rabies was practically eliminated from England up to the period of the war. During the war everybody got a little careless, and I suppose the dog filled the place in the household of those that had gone to the field of battle and he was given further privileges. Again they had a large outbreak of rabies, along about 1920, in England.

Japan tried a very interesting experiment. Tokio started an antirabic campaign and vaccinated one-half of the dogs in Tokio. Of the large number of dogs vaccinated, I think thirty-one developed rabies. Of these, fifteen developed rabies within forty days. So one might say that in all probability most of those fifteen were already infected, and the disease was probably somewhat advanced before they were vaccinated. In the other half of the dogs that were not vaccinated, 1,323 developed rabies. In other words, it was 31 against 1,323, and undoubtedly some of those 31 were infected before they received the vaccine.

**Prophylactic Treatment**

We have prophylactic treatment. The best prophylactic treatment that we know of is the doing away with any dog that is the least bit suspicious and the muzzling of the rest of them, if you have any reason to feel that they might be infected. In summer months, when dogs run so freely, I think they should all be muzzled. No dog should be on the street unmuzzled in warm weather; it is a question whether he should be on the street at any time unmuzzled.

I know nothing about the question of vaccination of animals excepting what I have told you about this Tokio experiment with dogs.

In the human we believe that we have a very efficient method of prevention. No preventive that we have against disease up to this day is absolute. We might as well face that. We can give typhoid vaccine to our soldiers, and occasionally one will not react sufficiently to prevent his contracting typhoid if he receives a massive dose of germs in water, milk or what not. The same thing is true of diphtheria. There are certain groups of the diphtheria bacillus that it is difficult to get antibodies against. They will cause a diphtheria epidemic, even though you use serum prophylactically and for curative purposes, and even end in death. We know the same thing is true in tetanus, so it is
with hydrophobia. But we do feel we have a measure that should be used under all circumstances.

First, if the dog cannot be kept under observation for ten days (practically every dog that has rabies will manifest it within ten days of the time that he starts on the rampage); secondly, if the dog dies under suspicious circumstances, even though you do not think it is rabies, even though he has not manifested the classical symptoms of rabies, that is paralysis of the larynx and drooling of saliva and the ocular manifestations, of which I will speak later in the human; again, if the dog is unknown and bites a child and goes on, or if the dog for any reason dies—those are the conditions under which you should inoculate an individual under all circumstances.

It is our rule to vaccinate all children who are bitten by anything that might be considered a suspicious dog or a dog that we do not have complete control over, even though he is not suspicious.

**Many Children Given Treatment**

One might ask, are there any dangers to this vaccination? It is reported that about one in 3,000 of the individuals receiving rabies vaccine manifests some degree of paralysis. When you compare that with 15 per cent of the susceptibles in the human, of course, everything is in favor of giving the vaccine. We have had occasion, at the County Hospital and the other institutions, to vaccinate a great many children. A year ago this summer (not so many this summer), we had something like 70 children coming back daily for their vaccination, children who had been bitten. We had a little epidemic of rabies at that time. That was the time the films were made. I have never seen a case of paralysis following vaccination. The literature, however, contains such cases, and one should know the shortcomings as well as the more valuable points regarding vaccination.

There are two kinds of vaccine on the market. That made according to the original method of Pasteur consists, in ordinary practice, of giving 21 inoculations of an attenuated virus, prepared from the spinal cords of rabbits. The cords are taken from infected rabbits at intervals and suspended in bottles to dry, over potassium hydroxid, at a temperature of about 73, for a given number of days. Then twenty-one injections are given, starting with the weakest cord and gradually increasing the dose
until they get the very virulent cords, the eight-day cords, we will say.

There is another method, that of Semple, who emulsifies the central nervous system tissues in saline solution and adds one-fourth of one per cent of phenol as a preservative. With the Semple method we give fourteen instead of twenty-one injections. Parke, Davis, Squibb, and Mulford put out both the Semple and the Pasteur treatments. I think Lilly puts out only the 14-dose, the Semple. Which one is the most efficient, nobody knows. The Pasteur has been tried over a long period of time. About 1884 Pasteur reported his first work. He started in 1880. We have had the better part of almost one-half century to try this out. We are more in the habit of using the 14-injection method. Ordinarily, if we are not particularly anxious about the case, because the dog does not look bad, or the child was not bitten badly and we have seen it early and had a chance to cauterize the wound, we give an injection every day. We give it in the abdominal wall. It is given subcutaneously. However, if you are suspicious of the dog, do not give it once a day, but see that it is given twice a day, for at least the first fourteen shots. In other words, to accomplish anything you must do it in a hurry in the case of a dangerous bite from a known rabid dog.

Emergency Treatment of Dog-Bites

A question that often comes to mind is: What are you going to do in an emergency when a dog bites a child? Many little drug stores do not carry the vaccine; in fact, many big drug stores in Chicago do not carry it. You have to do something in an emergency. I would say the same thing that applies to a snake-bite (without the whiskey, of course, because many drug stores do not carry that) applies to a dog-bite. It is somewhat dangerous, of course, to suck the wound, and I would hesitate to do it myself. But you can put on a constrictor, an Esmarch bandage, or tie a rope around the leg or the injured extremity, if it is an extremity, and thereby hold back the circulation until you can cauterize the wound. In the face that is much more difficult, and, as I said, face wounds are usually deeper than the soft tissues and offer a much more serious problem. I would say that that would be the first thing to do. That applies particularly to an animal. Animals are usually more commonly bitten in the extremities than they are, I believe, in the body or the head.
The next thing to do is to cauterize it. What is best to cauterize it with? I think most authorities agree that nitric acid does the business as well as anything; that is, after you have first enlarged the wound, if it is a punctured wound, and trimmed out all the tissues you think are infected, then burn them out with nitric acid. You have to have the courage of your conviction when you cauterize with nitric acid because it is not pleasant. The next best thing is formaldehyd. That is available almost anywhere. If you do not have either one of those two, carbolic acid can be used. Nitrate of silver could be used, and bichlorid could be used, but there is this disadvantage, particularly with bichlorid and nitrate of silver, and, to some extent, carbolic acid, there is danger of coagulating albumin which buries just the thing that you want to eliminate or ventilate. Iodin could be used.

The specific treatment is supposed to last for one year; that is, a child bitten today would be immune for the better part of the year to follow. After that, you have to consider re-vaccination in case of another bite.

**Disease, Once Established, Is Incurable**

There is no treatment for the cases which have developed the disease. There has been an attempt made in this city to do some work under the direction of Dr. Blatt, at the Cook County Hospital. The staff discussed the matter when we were running the large number, year before last. It was suggested it might be well to draw blood from these children who had received the vaccine and who had thereby developed some degree of immunity, and preserve the serum and try it in other cases that might come along, with the hope that it might retard the disease or even cure it.

There has been no practical demonstration of its value up to date. Then one of the manufacturers of serological products was encouraged by Dr. Blatt to undertake the making of a horse serum. Then I think they also applied it to one of the other animals, by inoculating increasing doses of active virus. The organism that we find in the nervous system, which is of such diagnostic value to us, is known as the Negri body. There is a question whether this is a protozoon or not. A good many think it is.

Of course, every dog should be examined for Negri bodies if you are at all suspicious. They can be demonstrated in at least
50 per cent of the cases and are conclusive evidence of the disease, even though the dog has not manifested symptoms of the disease.

You will note from the picture that I am going to show that these children are terribly fearful of swallowing. Every one of them demonstrated the same thing. There is a clonic spasm of the muscles of deglutition. In tetanus you ordinarily see clonic spasms. These children have clonic spasms, a constant spasm of the muscle. Peculiarly enough, a dog will not drink; that is where the word "hydrophobia" comes from. He will swallow about everything else. He will bite into wood and swallow pieces of it and swallow rags, chew up saddles and swallow leather. If you open up a dog that you suspect has rabies, you will find that its stomach will be absolutely empty of food, but it will contain rubbish. That is of real diagnostic value. It is a simple thing to think of but it has a real practical value.

The first film is one that I prepared for the Eastman Kodak Company. It is an educational film and shows the pathology of this disease. Then there is one case that I took, and following that we have Dr. Blatt's film, showing three cases. All four of these cases occurred in a period of three weeks in Cook County Hospital in the summer and fall of 1928.

Dr. Hess then showed several films illustrating the clinical aspects of human rabies. (Applause)

DISCUSSION

PRESIDENT LAMB: Gentlemen, Dr. Hess has very beautifully introduced the subject of rabies which I know is going to be of great interest.

Dr. Hess, in the name of the Association, I want to thank you very much for your beautiful exhibition. It has been very interesting indeed, and I trust you do not have an engagement for the next hour or two, because I anticipate there will be a lot of questions submitted to you.

The paper of Dr. Hess is now open for discussion.

DR. G. W. STILES: How nearly perfect is vaccination in the human?

DR. HESS: It might be considered almost an absolute preventive if given immediately after the bite. There are some cases on record, in fact two cases have recently been reported in The Journal of the American Medical Association in which the treatment was started shortly after the bite. These children received their treatment once a day for fourteen days. The fourteen injections were used in both of these children. I am not sure that they were both children, but they developed fatal rabies. Reports of cases in the literature, where treatment was given as early as it was in these two cases, are exceptionally rare.

As I said, no preventive therapy known today is absolute, but I think that this is the real preventive measure. The dog usually manifests some evidence of rabies or the nature of his illness early after he bites. If the dog is a stray dog, the child should receive treatment immediately. I mean that is a responsibility that comes to the hands of the physician or, in your work, the veterinarian. The treatment should be instituted at the very earliest possible moment, unless you know the dog and can watch him, and he does not, of course, manifest active signs.

DR. STILES: Are there any authenticated cases of recovery in humans after the disease once developed?
DR. HESS: None that I know of.

DR. C. P. FITCH: Do you have any difficulties, if we can call it that, among the medical profession in Cook County or any other county you have come in contact with, failing even to admit that there is such a thing as rabies or simply passing it off as of no particular importance? That was brought to my attention very vividly about ten days ago when I was speaking before a group of Minneapolis business men. There happened to be a physician in the audience, and he said, "Did you ever see a case of human rabies?" I admitted I never did. He does not believe that human rabies exists.

DR. HESS: I think there was more of that before 1928 than there has been since. Nicholas Senn, who was probably one of the greatest surgeons that ever lived in Chicago, as late as 1900 said there was no such thing as rabies; he had never seen a case. I am sure you will agree that there is.

There is another disease, lyssophobia, which is hysteria that goes with the dog-bite. You never see the clonic spasm. Sometimes a woman who thinks she has rabies says, "I can't swallow." She has heard that such people are afraid of water. Sooner or later they quit. One dose of morphin puts them under, and they wake up all right. The best way to do is to "snow" them under, so to speak. There is rabies, and I think physicians pretty well acknowledge it now. It is only at long intervals that we see such a group of cases as we saw in 1928.

DR. A. T. KINSLEY: Would you recommend, where there has been a known rabid dog bite on the face, to diminish the length of time in which the fourteen treatments are given?

DR. HESS: Yes, two a day.

DR. KINSLEY: Would you give more than the fourteen?

DR. HESS: That question came up in these two cases reported in The Journal of the American Medical Association. A man who had experienced one of the cases said, "We should have given more shots." I do not know whether more would have done it or not. Undoubtedly it must have been a very virulent virus, or else the vaccine he was using was no good. You all know that some of the sera are no good. I had such an experience during my army service. At one time we had 122 cases of meningitis which were given serum. We might just as well have used boiled water. They called on the Rockefeller Institute for help and asked if they could not give us serum, but they said, "Possibly the New York State Board of Health can help you out." We got a batch from there, and from that time on our mortality was reduced from 70 per cent to 8 per cent. You know that is true of sera generally. That is simply a concrete example.

DR. C. H. CASE: If a person had a dog with rabies and had been handling him and had a scratch on his hand from some other cause, would you advise treatment?

DR. HESS: If I had it myself I do not think I would take the treatment. I think I would get busy and scrape the wound out and get some nitric acid into the depths of the tissue, if it were not a fresh wound, as you said. One would hate to lay down a rule for a thing of that kind.

DR. CASE: We had an experience where a dog bit four children that were playing around, on a Saturday. It jumped up and licked another boy on the face. They gave the four that were bitten the Pasteur treatment. The boy that was licked on the face had a wound. They thought it was not necessary to give him treatment. He died two months later of rabies.

DR. HESS: That was, again, a face wound.

DR. KINSLEY: On the same question Dr. Case asked, here is an owner of a dog. He has wounds on his hands and he handles that dog. Three days later the dog develops rabies. What are you going to do with that man?

DR. HESS: I would say he should get treatment.

DR. STILES: What about the milk secretion from a rabid cow?

DR. HESS: I made the statement that as far as we know there is no case on record of milk or meat causing rabies.

DR. C. A. DEADMAN: What control measures would you advise, looking forward to trying to eliminate rabies from the United States?

DR. HESS: In the first place, muzzle all dogs.
DR. DEADMAN: We have this disease with us all the time in America, worse in certain parts of the country than in others. In Wisconsin we have found that by using the county as a quarantine unit, absolutely insisting on the dogs being tied up during those ninety days, we were able to handle them very successfully.

If you had the cooperation of the dog-owners you could get somewhere with the quarantine. With the muzzling ordinance or rule, we found that if we ordered them to put muzzles on, after about an hour two-thirds of the dogs were in a first class dog fight and had their muzzles hanging around their necks. Then the people got into the habit of putting the dog's muzzle around his neck, and they said, "His muzzle is on him." (Laughter) That was as far as the muzzling went. They simply had an extra decoration around their necks.

The tying up of dogs has not injured any dog. We tied up all the dogs in several counties as well as we could, but in one particular case I had 40 or 50 dogs of my own, tied up, and as far as I could see, it did not do a bit of damage. Dr. Killham, state veterinarian of Michigan, stated it very nicely last summer when he said that he thought people thought more of their dogs' comfort and pleasure than they did of the lives of children.

I think the time has arrived when this body should take this matter either to Congress, if that is the place for it, or to their individual legislatures and try to have a certain period of time set apart, ninety to one hundred and twenty days, in which the dog should be tied up or shot. We can eliminate this disease from this country. I should like to quote Dr. Killham again when he said it was a national disgrace.

PRESIDENT LAM: In my own slight personal experience with rabies, it has seemed to me that the worst enemy that we have to contend with in the control of this disease is the Society for the Prevention of Cruelty to Animals, who object, in my locality, very strenuously to any regulation which will interfere at all with the pleasure or comfort of a dog, as the gentleman said.

DR. J. W. CONNWAY: I wish to emphasize the importance of making a diligent search for the Negri bodies in every case of suspected rabies; and especially when the history of the animal and other circumstances connected with the case are obscure. In the smears from the brain cells of some rabid animals, as every laboratory diagnostician knows, the Negri bodies are few and far between, and the task of finding them is occasionally very wearisome and time consuming, even in fields where the brain cells (from Ammon's horn or the cerebellum) are fairly numerous. The time and labor of finding the Negri bodies can be lessened by relying more upon the use of the low power of the three-objective microscope, not only for finding groups of brain cells, but also for discovering the Negri bodies within the cells. Moreover, when the cells containing these inclusions are but few in the field, among numerous apparently normal cells, the individual infected cell can, by the aid of the low power, be properly and quickly centered for a more decisive diagnosis with the immersion lens; that is, by demonstrating the presence of the chromatin granules within the Negri bodies.

Dr. Durant, one of my associates, who has this special work in charge, as a routine practice makes the diagnosis with the low power, then appeals the case to the higher court of the immersion lens for confirmation; and thus far has never had his first decision with the low power reversed. The whole point of bringing this matter up is to stress the value of this procedure not only in saving time but also in ensuring a positive finding in cases of rabies where the Negri bodies are scarce in the smears examined. No doubt a good many laboratory diagnosticians have used the procedure mentioned to facilitate the diagnosis of rabies; but I happen to know that some have expressed their doubt that the Negri bodies can be seen with the 2/3-inch (16-mm.) objective. Moreover, none of the text-books, laboratory manuals, or other literature on rabies that we have studied makes mention of the fact that the Negri bodies can be readily seen with the low power named. I commend the diagnostic procedure mentioned to those who have not used it; and who have much work of this kind to do.

DR. H. C. BECKER: The question as to the matter of eradication, naturally, is one of prime importance. This disease is more or less prevalent throughout the United States, which recent surveys have shown. I believe you would all
be interested in knowing what we have done in the Department of Health of the City of Chicago in the handling of what has been known to be the biggest epidemic that we have ever experienced in this city.

Rabies in Chicago for many years was at a low point, but beginning about September, 1927, the cases began to increase. In the first ten months of 1928 we had, in Chicago, fifteen human deaths. Those fifteen deaths were more than we have any record of previously.

The matter of eradication was taken into consideration, methods and means whereby this disease could be eliminated. We believed that the stray-dog problem was one of major and first importance. We have a dog population in Chicago of around 150,000, so the first step toward eradication was the matter of ridding the city of stray dogs. Beginning in January of 1928, or just a month or two previous to that, I might say, we started out after the stray dogs. We put on five dog-wagons and doubled our dog-catching force and went out after the stray dogs. In 1928 we caught and destroyed 50,000 dogs in the city of Chicago. In the month of July a year ago, we caught and destroyed 7,000 dogs. In the month of July, the peak month, there were reported to the Department of Health nine persons who had been bitten by dogs. In connection with the riddance of stray dogs, all persons who had been bitten by dogs were required to report to the Department. The dogs which had bitten the persons were kept under observation for a minimum period of two weeks.

The matter of Pasteur treatment: We have supplied free of charge as high as 160 cases per month with the Pasteur treatment. In the year 1928 I believe we supplied treatment to over 1,000 persons.

The matter of laboratory diagnosis: The percentage of dogs whose brains were found to contain Negri bodies as compared with the total number of dogs submitted to the laboratory was very slight. Between September, 1927, and January, 1929, the percentage of infected brains ran as high as 95 per cent. In other words, 95 per cent of all of the dog-heads submitted to the laboratory (we ran from 4 to 14 a day) showed the presence of Negri bodies.

Formerly we used the system of sectioning the brain, which took time, and about the best we could do would be twenty-four hours to get a report. With the system adopted by the laboratory during the past year, we have been able to examine the brains in a great number of cases in fifteen or twenty minutes by direct smear. If they do not show in a direct smear, a section is made, and the section is examined. If the section does not show anything, then two or three pigs are injected. In other words, we take no chances.

With reference to the treatment of cases which have been bitten or are suspected of having been bitten, or cases of dogs affected with rabies, licking a hand which may have had an abrasion, we take no chances. We always recommend treatment where there is the slightest chance of infection. The cases you see in the picture are some, I believe, in which they were recommended to take the treatment or refused to do so. We have had two or three cases which I recall, in which we begged the people to take the treatment after we knew they had been bitten by rabid dogs, and they positively refused to do so.

After our campaign, beginning about September, 1927, up to the present time, what has been the result? Dog-bites reported to the Department are very few. They have been very few this past several months. Pasteur treatments supplied to those who could not afford treatment, have been very few; I think around five or ten a month. The percentage of heads found positive as compared with the total number of heads submitted to the laboratory is running very low.

In connection with stray dogs, ridding the city of stray dogs and keeping under observation dogs which have bitten persons, we have carried on quite an extensive educational campaign. Any of you who have ever had any experience in trying to do something with dogs, even though they may be the cause of a very serious epidemic, will appreciate that you have an uphill road to go. We have advocated muzzling. It has not been enforced to the letter, however.

While at the present day there is not a unanimous opinion as to the value of vaccination of dogs, nevertheless we have encouraged it. Last but not least,
we have taken absolutely no chances but recommended the Pasteur treatment to anybody bitten or suspected to have been bitten.

I reviewed the literature on the vaccination of dogs, all the work that has been done on it for centuries. It has been reported to us that there are many cities in the United States which have adopted a very successful system of eradication by advocating and enforcing the vaccination of dogs. As far as I have been able to learn—and we canvassed almost every large city in the United States—there are one or two cities that claim real results or results really worth the effort in enforcing and demanding vaccination of all the dogs. We encouraged and recommended it in Chicago, but we did not demand it because of the fact that according to the best information that we could obtain it is not entirely satisfactory.

PRESIDENT LAMB: Gentlemen, we have without doubt enjoyed this discussion on rabies, but we must proceed with the regular program and consider diseases of poultry. The first paper on that subject is "Commercial and Economic Aspects of the Inspection of Dressed Poultry by Government Agencies," by Mr. Roy C. Potts, Specialist in Charge, Division of Dairy and Poultry Products, Bureau of Agricultural Economics, Washington, D. C. (Applause)

COMMERCIAL AND ECONOMIC ASPECTS OF THE INSPECTION OF DRESSED POULTRY BY GOVERNMENT AGENCIES

By ROY C. POTTS, Washington, D. C.

Specialist in Charge, Division of Dairy and Poultry Products,
Bureau of Agricultural Economics, United States
Department of Agriculture

MR. PRESIDENT AND GENTLEMEN:

I cannot pose before you as a veterinarian nor as an expert poultryman. You may therefore wonder why I am here on this program to discuss the subject "Commercial and Economic Phases of the Inspection of Dressed Poultry."

When the American Veterinary Medical Association held its meeting at Detroit, last August, it requested Dr. Ives, of our New York office, who has charge of our dressed poultry and live poultry inspection service in this district, to appear on the program. Dr. Ives could not be there. I happened to be in Detroit at that time and offered to read his paper or to discuss some of the economic aspects of the inspection of dressed poultry. They asked that I discuss the latter subject. Dr. Hinshaw was there, and following my address he asked if I would appear on your program. I told him that I would. That explains why I am here.

I have placed here on the table pictures of four grades of dressed fowl, rather to give us a background for what we are going to say
this morning, briefly, I may say, on the subject of dressed poultry inspection.

A few years ago, and not many years ago, the poultry industry, from the standpoint of the veterinarian or the pathological research worker, was not considered of great importance. As a matter of fact, a sick chicken on the farm was shortly made into a dead chicken on the farm. But poultry in recent years has increased in value per pound. The commercial value of the annual poultry production of the country, not including eggs, approximates $500,000,000 annually. Our poultry industry, therefore, is today a relatively important commercial enterprise on many farms.

Our poultry industry, as it is being conducted, is becoming more of a commercial enterprise on more poultry farms. The producers of poultry, the representatives of the college staffs engaged in poultry husbandry work; the poultry extension specialists, the boys’ and girls’ club workers in poultry, the practicing veterinarians, the pathologists in our colleges, and the United States Department of Agriculture, are becoming more interested in the poultry industry. With all of this there is a larger public interest in the commercial aspects of the poultry industry.

**THREE BILLS BEFORE CONGRESS**

Doubtless you know that three different bills have been introduced in Congress, seeking to provide compulsory inspection of poultry in interstate channels of trade.

The Bureau of Agricultural Economics, which I represent, is in this game, so to speak, temporarily. When legislation is passed by Congress, this work undoubtedly will be placed under the Bureau of Animal Industry where it properly and rightfully belongs. It should not be the duty of an economist or practical marketing man to deal with the problems of pathological inspection of poultry. That is a veterinarian’s job, and more properly the job of the Bureau of Animal Industry, in connection with its meat inspection work.

How, then, do we happen to be concerned with this inspection work at the present time? A little history will indicate that. Some eight or nine years ago, the Canadian government encountered in its country a problem where manufacturers of chicken food products, so I am told, were mixing with their chicken in their canned products other animal products, including veal.
In order to control that industry properly, they passed a law and made that law applicable not only to domestic products but also products brought in from other countries. Under that law, products brought in from other countries must be accompanied by an export certificate issued by the government, certifying to the fact that the poultry food product contained in the package had been inspected and met the Canadian requirements.

With the enactment of that law, our poultry canning firms in the United States were barred from the Canadian market. One of them, after struggling seven years to find some way of getting the chicken used in their chicken soup, inspected, came to our Bureau. We happened to have a provision under our food products inspection law which authorized the Secretary of Agriculture to investigate and certify as to the class, quality and condition of poultry, poultry being specifically mentioned with other commodities such as butter, cheese, eggs, hay, cotton and other farm products.

Under that act, regulations were drawn, promulgated by the Secretary of Agriculture, and inspection service was undertaken for that firm. Shortly, in New York City, the Board of Health found conditions such, with respect to the canning of poultry by a canning firm in that city, that they decided they should have some regulations with respect to canned poultry in New York City. They passed an ordinance that poultry food products canned in that city or shipped into that city for sale must be inspected by an agency approved by the Board of Health of New York City.

**Inspection of Poultry Started**

This particular firm in New York City that they had investigated had in storage a number of carloads of poultry which, on examination by representatives of the Board of Health, were condemned but were permitted to be utilized in the manufacture of chicken food products provided those seized products were salvaged under government inspection. So government inspection of poultry for canning purposes was instituted in the establishment of that firm. This had its beginning in the year 1928.

In April, 1929, a firm in Minnesota undertook the canning of whole chicken and half chicken. That firm previously had been canning hams. It was successful in finding outlets for that product. Other canners of ham and chicken food products became interested in government inspection. Today we have
twenty-seven poultry-canning establishments that have in applications for the service and either have or shortly will have the service on their products.

What are we finding with respect to the condition of poultry coming to these poultry canning firms? I am going to take you into my confidence this morning with respect to the figures I give to you. I am going to ask the Association to let me edit the particular portion of the report which follows, because you know as well as I that information with respect to diseased conditions prevailing in any meat product is not the best sort of information to promote the consumption of that particular product. We want our efforts, from the standpoint of promoting better conditions in the poultry industry, to be positive; in other words, looking toward a betterment of the product, and the placing before the consumer of a better quality product. We do not want our activity to be negative, that is, broadcasting generally throughout the country, before consumers, the fact that there is a great deal of diseased poultry in the country. But you people, it seems to me, would be very much interested in knowing just exactly what the situation is.

* * * * *

You veterinarians and pathologists and others will be interested in knowing what are the most frequent causes or conditions for the rejection of poultry. I may say that in each establishment the inspector makes a record of each individual bird rejected and the cause of the rejection, so that figures are based on birds rejected, not pounds rejected, for any particular purpose or reason, because we cannot have sitting there a can for tuberculous poultry and another can over here where we can weigh out the pounds afterwards. We can, on our tally sheet at the inspection-table, mark down the cause of the rejection of each individual bird.

* * * * *

THE FUTURE OF POULTRY INSPECTION

What of the future of this inspection of dressed poultry by government agencies? There are, it seems to me, certain definite indications today which show that the inspection of poultry will increase rather than decrease. All of these plants that are packing government-inspected poultry carry on their labels the inspection legend of the United States Department of Agriculture, which inspection legend you find on the cans, that reads as
follows: "Inspected and certified by Bureau of Agricultural Economics, United States Department of Agriculture." These firms undoubtedly are going to tell the consuming public the significance of that inspection legend.

There is another development, too, in the poultry industry that, it seems to me, is going to call for a larger demand for this inspection service. That is the drawing of poultry in the country at poultry packing plants, quick freezing of that poultry, and marketing it in frozen form as frozen poultry meat.

I mentioned that three bills had been introduced in Congress seeking to provide legislation for the compulsory inspection of poultry. As I look at the poultry industry as a whole, we must recognize four classes of poultry from the standpoint of governmental regulation and inspection of poultry. The first class is live poultry. It seemed to me that governmental regulation of shipment of live poultry in interstate commerce could be adequately controlled as we control the movement of food products today under our pure food acts; in other words, making it (I guess you call it) a misdemeanor or illegal to ship diseased live poultry in interstate commerce, making it obligatory upon the part of the shipper of such poultry to remove diseased poultry before it moves in interstate commerce. Such a regulatory measure would seem to deal adequately with live poultry.

Undrawn Dressed Poultry

The next class of poultry that we have to deal with is undrawn dressed poultry. I would, for the purpose of regulation, divide undrawn dressed poultry into two classes. First, there would be the class which would be handled exactly as I have suggested, making it obligatory upon the shipper to cull out and remove from shipments of undrawn dressed poultry all birds which, from the standpoint of external appearance, would appear to be diseased. Then establish a second class of that class of poultry, which we would, for the purpose of consideration, call suspicious poultry. Maybe that is not the best name but that implies the idea that I have in mind. Then let the packers of such poultry ship it in interstate commerce under permit, that poultry to be moved to points where government inspection is maintained so that it can be salvaged, so to speak, or drawn and inspected before it can be moved into channels of trade. That, it seems to me, would be an adequate method of dealing with undrawn poultry.
Now we come to the third class which is drawn poultry. I referred a moment ago to the possibility of there developing in this country a new industry, so to speak, a new method of marketing poultry, and that is poultry that has been drawn at the packing plant. In other words, when the birds are killed, they would be eviscerated under government inspection, perhaps graded under government grade, each bird marked with the government grade, perhaps stamped, to show that it has been inspected, go into a sharp freezer and then be marketed in frozen form. Two of the plants for whom we are inspecting poultry today are marketing poultry in that form.

In order for poultry to be marketed in that form on a larger scale than it is being marketed today, we need two things: First, the cooperation of retail poultry dealers handling dressed poultry to equip their retail markets properly with refrigerators where they can carry that poultry below freezing temperature; secondly, an appreciation on the part of the consuming public that such poultry is better poultry and will give better satisfaction to the consumer than poultry as it is now marketed in undrawn form when packed in packing-plants of the Middle West, put into freezers and frozen with the entrails in the birds, then moved through to terminal markets, and in most cases bootlegged to the consumer under the guise of its being fresh-killed poultry.

**Replies to Questionnaire**

Why do I think that the consuming public, when we get the cooperation of the retail dealers and get this poultry moving into interstate channels of trade under government inspection, will welcome that type of poultry? I have a little evidence here in the form of some information that we obtained this last spring from consumers who had bought government-graded turkeys last Christmas. We asked one of the retail organizations that were selling government-graded turkeys to consumers to obtain the names of buyers of those turkeys in the retail store at the time the sale was made to the consumer. We obtained 2,000 names of consumers. I drafted a questionnaire which we mailed out to those 2,000 consumers. We received back from them 571 replies. Those of you who have had experience in circularizing and getting returns will grant that a return of more than 25 per cent is very good.

Without discussing how satisfactory those government-graded turkeys were, perhaps I should mention that 571 replies
were made to the question: "Was the turkey you bought satisfactory?" There were 550 who said "yes" and 21 said "no."

The next question was: "If unsatisfactory, state in what particular?" Almost unanimously they said that the birds were tough. They did not cook them enough. I will leave it to you, if you were handed 571 turkeys to pass out to 571 housewives, to be brought back in cooked form, how many tough ones would you find? Well, there is perhaps an explanation of why some of these were tough. We call hen turkeys "hen turkeys" without reference to whether they are young or old. I suppose some housewives were sold an old hen turkey by the retailer when they thought they were getting a young hen turkey, so they cooked it as they would a young bird, and the old bird came back to the table tough.

This year in our grading service we are labeling the old birds "mature" and the young birds are labeled "U. S. Prime" or "U. S. Choice" as they may be. It may interest you to know that this year we graded for the Thanksgiving market 175 carloads of dressed turkeys, 2,000 turkeys in a carload. We expect to get 250 carloads for the Christmas market. There is no activity that we have ever undertaken that seemed to prove more popular with producers in the producing sections and with consumers in the consuming markets than this government grading of poultry.

One question that we asked, question 6, was: "Do you think it desirable or of benefit to consumers to have other classes of dressed poultry government-graded?" Assuming that they had had some experience now with dressed turkeys: "How about grading other classes of dressed poultry? Answer 'Yes' or 'No'," We got 518 yeses and 12 noes.

"Give your reason for the answer you have just made to question 6." Here is the way the answers lined up: Confidence in government stamp, 330. I ask you, when the consumer can get government-graded, government-inspected, drawn poultry, frozen at the packing-plant, with the entrails out, moving through channels of trade, sweeter and better than it has ever been before, will it be accepted by the consumer? I say "Yes." They are accepting fish in that form. They are accepting fruit in that form. Why won't they accept poultry in that form when the consumers are told what this new method of handling poultry really means?
INSPECTION OF DRAWN POULTRY TO INCREASE

I say to you that government inspection of drawn poultry, at packing-plants throughout the Middle West and in this territory, is going to increase, because I sincerely believe that if Congress passes any bill for the regulation of poultry in interstate commerce under government inspection, it will require every one of those birds to be drawn under government inspection.

Another reason given by consumers as to why they think they would like to have other classes of poultry government-graded is as a protection to the consumer. There were 86 answers to that. To insure good quality, 65 answers; to insure purchaser that goods are not cold storage, 33. Our stamp did not guarantee that the goods were not cold storage, but I just bring to your mind the fact that the consumer is still thinking in terms of cold storage being something that injures the quality of poultry. Why does it injure the quality of poultry when you leave the entrails in, move those birds through channels of trade and get them into the retail meat dealer's shop? He thaws them out in water and may have them on the shelf two or three days before the consumers get those birds. The meat is simply impregnated with entrail taint. You and I think of this business of marketing poultry as poultry should be marketed. Thinking of it in terms of giving greater confidence to the consumer, we must think in terms of government inspection of drawn poultry at the packing-plant, that poultry quickly frozen like fish and moved into channels of trade to retail markets which are adequately equipped to handle that kind of poultry. I have eaten that kind of poultry. I am not here to advocate anybody's brand, but I believe I know, from the little experience so far, that when retailers will equip their shops, it is going to be an easy matter to sell the consumer poultry in that form.

INSPECTION INSURES PROTECTION AGAINST DISEASE

I just said that 33 of these people said, "To insure the purchaser against goods from cold storage." Here are 50 who said, "To insure protection from disease." In order words, 10 per cent of these people were thinking that government grading would insure them against disease. I sincerely believe that the consuming public, when it knows that it can get government-inspected, government-graded poultry, will welcome that kind of product. That from the consuming end.
Now from the producing end. When dealers buy poultry from producers and they know that all that is unfit for food is going to go to the rendering tanks or to the incinerators, they are going to buy on grade as they never bought on grade before. They are going to pass back that poultry, that has a low market value, to the producer. As a matter of fact, the price offered will be so low that there is a question as to whether or not the producer can afford to produce it.

The producer then will be interested as the producer never has been interested before, first, in keeping only healthy, vigorous poultry, and, secondly, in keeping that poultry healthy. There is where he may want the help of the veterinarian. If roup breaks out or any other disease, he may want the help of the poultry extension specialists and the county agent with respect to sanitary conditions. It will not hurt the veterinarian if he knows a whole lot about those things because some poultry diseases can be dealt with easier by providing proper sanitary conditions on the farm than by any other method.

It seems to me that with the rejections that we have today, 4 per cent, we are just getting started in this. There will be pressure back there on the producer and a demand from the producer for more information, more help from all agencies that are able to help him to produce healthy poultry—not only to produce healthy poultry but to develop that poultry so when it goes to the market it will class in the higher grades rather than in the lower grades.

There are certain economic aspects that this government inspection of poultry, from the standpoint of the consumer, from the standpoint of the producer, from the standpoint of people engaged in packing and marketing, in the future is going to become a much more important thing than it is today.

I have not discussed in this talk the pathological phases nor the technic employed in the canning-plants in making inspection.

There is present Dr. C. E. Edmunds who is in charge of our work in the Chicago district. If you have any questions to ask with respect to those phases of it, I shall call upon him to answer your questions.

**Discussion**

Dr. C. P. Fitch: I would like to ask Dr. Edmunds if there are special rules and regulations governing the pathological inspection of poultry.

Dr. Edmunds: Yes, there are. We have a set of rules and regulations that we follow pretty closely. We have copies of those at our office in the Mercantile Exchange Building, and if anyone would care to have them, we shall be glad to give them to you.
DR. H. D. CHAMBERLAIN: Illinois started tuberculosis eradication work in chickens about three years ago. For the very point that the doctor mentioned, we have withheld publication of our figures at the request of the packers of the State, because they did not want to excite the minds of the people. Mr. Potts’ report coincides very closely with the work of the state of Illinois.

We did work in seven counties in Illinois. I will give you a summary of the work in one county. In Clinton County, in the southern part of Illinois, there is an extensive chicken industry. We tested about 90 per cent of the flocks of Clinton County. There were 1117 flocks tested, or 237,265 chickens. Our reactors were 9,016. We divided these chickens into old and young as nearly as we possibly could. I will say that the test started January 1, 1929, and was closed June 1, 1929.

We had 670 flocks without a reactor. That is a little over 50 per cent. The number of old chickens tested was 108,483. The number of young chickens tested was 129,645. The number of old reactors was 7,077; number of young reactors was 1,939.

We posted all these birds under government inspection at one of the big plants of the State. The result of posting was: number passed, 6,063; number condemned, 2,294; not autopsied, 266. Of that 266 that were not autopsied, there were some that were killed on the farm as being unfit for food, and there was no use paying the expense for posting them. Then one or two farmers failed to bring the birds in.

The result was that, of the chickens tested, 96.4 per cent passed and 3.6 per cent reacted. The reactors were divided into young and old. Of the reactors, 75 per cent were passed as fit for food and 25 per cent were condemned. Chickens of the '28 hatch were tested, and only a few of the hatch of '29 were tested.

In the last biennium we tested 1,725,348 in the State. The testing of birds, the educational campaign, and all the expenses connected with it, were done at a cost of 5.9 cents per bird.

We started the work, in the first place, to get rid of the reactors, which is one of the hardest things to do. In the fall of '26 we entered into an agreement with the packers by which our birds were handled at a very economical point. Speaking of dressed poultry, I took the matter up with one of the biggest packers about a year and one-half ago with regard to opening the birds, freezing and shipping them. We started in an experimental way about a year and one-half ago, and sent to the heads of some of the Chicago packing-plants a package for Thanksgiving. Those birds were drawn, the heads were taken off, the feet were cut off, and they were wiped out. The livers and hearts were placed in parchment paper, and the gizzards were cleaned and put in. We froze them to below zero immediately. There was no water in connection with them. All those birds were wiped out with clean cheesecloth and frozen immediately.

DR. A. F. SCHALK: I would like to ask Dr. Edmunds to explain the regulations governing the disposition of the tuberculous carcasses in these packing establishments.

DR. EDMUNDS: Where there is a generalized condition, of course, the whole bird is rejected. Where we find there is only one organ affected with tuberculosis, and we believe it is localized at that point and has not gotten through the flesh of the bird, we remove all of the internal organs and pass the bird for food. Most of the birds, in fact all of them, are sterilized in the process. Of course, if the bird is not in a well-nourished condition, they are condemned immediately. Of course, we use considerable caution as to how much is affected.

DR. SCHALK: Then it is more the physical condition of the bird rather than the extent of the condition which governs the disposition?

DR. EDMUNDS: The physical condition of the bird is taken into consideration to that extent. As I mentioned, if it is well-nourished condition, and it is a localized condition in one organ, we remove the organ and pass the bird for food.

I should like to invite any of the members here this morning to go along with me at any time, if they have an opportunity, and I will be glad to take them to some of our plants and let them see just how the work is carried on.
DR. A. W. MILLER: I would like to carry Dr. Schalk's question just a little further. If you have two or three small foci in the mesentery and slight lesions in the liver and the bird is in prime condition, what disposition would you make of such a bird?

DR. EDMUNDS: The regulation that we follow in that particular case is that if lesions present themselves in more than one organ of the bird, it is condemned for food.

DR. SCHALK: Regardless of the physical condition of that bird?

DR. EDMUNDS: Regardless of the condition of that bird.

PRESIDENT LAMB: If no one wishes to discuss this paper further, we will proceed with the next paper on the program which is "Merits of Cutaneous Vaccination Against Fowl-Pox," by Dr. H. J. Stafseth, Michigan State College, East Lansing, Michigan. (Applause)

. . . Dr. Stafseth read his paper. . . . (Applause)

MERITS OF CUTANEOUS VACCINATION AGAINST FOWL-POX


Department of Bacteriology

Michigan State College

At the meeting of the American Poultry Science Association held at Auburn, Alabama, in August, 1929, the writer presented a paper dealing with various phases of his studies of cutaneous immunization against fowl-pox. Some of the conclusions drawn from these studies are as follows:

1. Fowl-pox can be controlled by the use of a living virus vaccine cutaneously.
2. The best results are obtainable in birds that have not reached sexual maturity.
3. As a mild reaction confers complete immunity with less unfavorable results than produced by severe reactions, attempts should be made to secure moderate local lesions, either by the use of a highly diluted virus, an attenuated virus or by applying the vaccine in such a way as to prevent too severe takes.
4. By using a highly diluted virus, birds may be vaccinated with safety during winter weather.

In a recent publication by Beaudette we find the following statements:

The product used by us is nothing more than a suspension of powdered fowl-pox scabs in a 50 per cent glycerin solution. We have used as much as 2 grams of ground scabs to 25 cc of the vehicle which is considerably more than that used by Johnson. At the present time we are using 1 gram of powdered scabs to 40 cc of the solution. The reaction produced in birds just coming into production is quite severe. Egg production ceases almost entirely and between the second and third weeks after vaccination, the flock may present rather grave symptoms, but in spite of this the mortality is negligible. We have not, however, vaccinated birds which were in heavy production. The application of virus to birds only ten weeks of age produced no ill effects beyond a transient loss of appetite between the second and third weeks.
CUTANEOUS VACCINATION AGAINST FOWL-POX

Beaudette seems to be of the opinion that a rather severe take is preferable to a mild take, as the latter may not confer lasting immunity.

Beach used a vaccine made as follows:

The concentrated vaccine which contained 0.25 gram of lesion tissue or virus per cubic centimeter was diluted, at the time of use, sufficiently to make each cubic centimeter contain .002 gram of tissue. The same dilution was used for vaccination by both the subcutaneous and feather follicle methods.

Discussing his results Beach states:

In the foregoing report of the results of vaccination of healthy young fowls with live virus chicken-pox vaccine, specific mention of flocks has been made only in case the results were unsatisfactory. This has been done so that prominence might be given to the fact that very undesirable post-vaccination reactions have sometimes occurred, even when the condition of the birds and of the surroundings appeared to be entirely satisfactory. The data show, however, that, with birds in good condition, the undesirable results are not liable to occur frequently and, therefore, that the vaccination of healthy cockerels and non-laying pullets or hens may be regarded as a relatively safe procedure. The hazard attending the vaccination of laying pullets, although apparently greater than of non-laying birds, does not seem to be great enough to make this a practice to be avoided entirely in case the flock without vaccination is quite certain to become infected with chicken-pox later.

He warns against the vaccination of birds in poor condition or affected with other diseases because they may be expected to react unfavorably to the vaccine.

Johnson, in his recent article on "The Stick Method of Cutaneous Virus Vaccination Against Fowl-Pox," states that he has obtained very satisfactory results by puncturing the skin of the leg externally and posteriorly to the proximal end of the tibia with a No. 6, B-R-X or No. 11 Bard-Parker blade, dipped in vaccine just before each stick. Milder takes, quicker healing of vaccination lesions and less systemic reaction result from this method of vaccination than from the follicle method. The vaccine used consisted of 17 mgs. of powdered pox scabs in 3.1 cc of distilled water. He suggests that even more virus could be used without any disadvantage. Attention is called to the necessity of intelligent handling of the virus based on an adequate knowledge of its nature.

**Experimental Work**

*Preparation of vaccine:* The vaccine was made as previously reported, the amount of virus per 100 cc of diluent being 180 mgs. in most instances. Now and then more or less virus was used, depending upon its virulence and the time that would elapse between the manufacture of the vaccine and its use. If it was thought that several days might pass before the vaccine
would be used, 200 mgs. was usually added to 100 cc of diluent. Only once was 200 mgs. used per 50 cc of diluent. Following the use of this amount of virus a marked tendency to generalization of pox lesions was noted and for this reason the amount of virus was reduced. During the summer and early fall months 200 mgs. was used per 100 cc of diluent and when colder weather set in the amount of virus was reduced to 180 mgs. In all cases an attempt was made to obtain a suspension of the powdered virus that would show as few particles as possible when shaken and held up against the light. This was done to secure an even distribution of virus in the vehicle and, thus, the greatest possible uniformity in takes. Several tests on commercial as well as our own vaccines showed that their keeping quality was not very great when exposed to room temperature. Therefore, vaccine suspensions were prepared only when requested for immediate use (within 2 to 3 days). When the vaccine was to be sent by mail, it was cooled in the ice-box, wrapped in cotton and corrugated paper and then enclosed in a double mailing-case. The diluent as well as the powdered virus are always kept at ice-box temperature.

APPLICATION OF VACCINE

The follicle method: Since July 1 of this year, more than seventy thousand birds have been vaccinated by the follicle method. The vaccine was applied with a small swab, dipped in the vaccine before application to each bird, to an area on the leg immediately above the tibio-metatarsal articulation after pulling out a few feathers (usually four or six). Those who were to apply the vaccine were warned against handling any birds for fear that they might infect the eyes or other parts of the head by touching them with their fingers, which were quite sure to be more or less contaminated with virus.

The results of this method of vaccination agree very closely with those reported previously¹ and also with those of other workers. Healthy birds less than 14 weeks old showed very little ill effects, while birds affected with coccidiosis, worm infestation, roup or malnutrition often responded very unfavorably. Fortunately most flocks, especially those which were vaccinated while on the range, came through with as good results as could be desired. Laying pullets and hens were more severely affected. Egg-production was reduced in most instances and in a few cases it was completely stopped. Vaccination of sexually mature birds also resulted in a considerable amount of generalization of pox
lesions, mostly in the form of cankers in the mouth, larynx and eyes. Scabs on the comb or other parts of the head also were produced. The mortality was low in most cases. From the available reports on the results of vaccination in the field, we find that one person, who had a flock that was heavily infested with worms, stated that 30 per cent of his birds showed generalized pox lesions, but very few died.

Another, whose flock had been put in winter quarters just before vaccination, reported a loss of 150 out of 600 birds. This flock had chronic coccidiosis. A third poultryman lost 105 out of 513 vaccinated birds. His flock had roup, coccidiosis and worms at the time of vaccination. This man reported that he applied the vaccine very liberally, as it seemed to him "that just dabbing so little of that stuff on the leg wouldn't do much good." He said that he felt like getting his money's worth while he was at it. This gentleman was also frank enough to inform me that he thought that he might have infected some of the birds by handling them while his hands were contaminated with virus. He thought so because he had examined the injured, bleeding comb of a pullet while he was vaccinating and found this pullet to show pox lesions over the injured area just a few days afterwards. These are the most unfavorable results reported since July 1 of this year, so it is evident that as a whole the vaccination has been quite successful.

Uniformity of takes: When 200 mgs. of powdered virus was used per 100 cc of diluent, we invariably obtained 100 per cent takes, while with only 180 mgs. of virus per 100 cc of diluent the percentage of takes varied considerably. The reduction in the amount of virus used was made, hoping, thereby, to obtain milder takes and less severe systemic reactions resulting in generalization of pox lesions, reduced egg-production and loss of weight with temporary retardation of growth in young birds. However, the irregularity of takes produced by the more dilute as well as attenuated viruses caused us to look for other means of securing the desired results.

The skin-puncture method: Since scarification of the skin had been shown¹ to increase the number of takes produced by attenuated vaccines, it was thought worth while to try to vaccinate by puncturing the skin. The fold of skin extending between the humerus and radius was considered to be the most favorable place for making the puncture inoculations because few feathers are found on its under surface, thus making it unnecessary to pluck
any of them in preparing for vaccination or in examining for takes. In making a puncture at this point one runs no risk of injuring bones or muscles. A vein runs across this fold, but it is readily detected and, therefore, may easily be avoided. The instrument used for making the puncture was a pair of sharp-pointed scissors about 10 cm. in length. A thin cord was tied around the blades about 5 mm. from the tip of the points in such a way as to hold them about 4 mm. apart. This cord also served to hold more vaccine than could be held by the points of the scissors, thus assuring a little heavier inoculation and a greater regularity of takes. The scissors were dipped in vaccine before each puncture. Fig. 1 shows how the puncture is made. It should be noted, however, that in actual practice one person should hold the bird and another one do the vaccinating.

In order to compare this method of vaccinating with the follicle method, using the same vaccine (180 mgs. of virus in 100 cc of
50 per cent glycerinated physiological salt solution), 230 young birds were vaccinated by the follicle method and 228 by the wing puncture method. The birds were vaccinated August 23, 1929, and readings of takes were taken 10 and 21 days following the application of the vaccine. All birds were weighed just before and most of them 10, 21 and 46 days following vaccination. Since both lots of birds showed about the same rate of growth, only the initial and final weights are recorded here. Table I shows the results of this experiment. No outstanding difference can be noticed as far as the effect on the birds is concerned.

The follicle method produced 1.45 per cent more takes than the skin puncture method and the birds vaccinated by the follicle method gained 5.6 gms. more on an average than the others, in 46 days. This difference in gain may have nothing to do with the method of vaccination and individual resistance to the pox virus might account for the small difference in the number of takes. Twenty-one days after vaccination, the birds vaccinated by the skin puncture method showed 13.29 per cent healed vaccination lesions and the others 8.38 per cent. None of the groups showed visibly ill effects of the vaccination. The wing puncture method is much quicker than the follicle method and also requires a great deal less vaccine. In our experiment, three punctures were made but the results indicated that one would have been sufficient. This experiment will be repeated, using a more concentrated virus and also employing the technic suggested by Johnson.

**DISCUSSION**

The results obtained by the different workers on fowl-pox immunization agree very well. They show that cutaneous vacci-
nation with a living virus is practical, effective and quite safe when applied to young and healthy birds, while it is also very evident that decidedly undesirable results may be obtained from the vaccination of laying hens or birds that are ill or in poor condition from one cause or another. However, the results of vaccination are very seldom as bad as those of an outbreak of fowl-pox. When this disease makes its appearance in a flock during the fall it often remains there until spring. By vaccinating flocks at the first sign of pox, we have invariably been able to stop the outbreak in 4 to 6 weeks.

Some of the unfavorable results caused by vaccination are undoubtedly due to faulty handling of the virus. One such case has already been mentioned. Incorrect diagnoses, in which pox was mistaken for roup and vice versa, have been found to account for some of the so-called breaks. Due to a general lack of knowledge of the true nature of pox and roup and the recognizable difference between these two diseases, mixed avian bacterins are often used in the hope that they will prevent pox and some people think that the fowl-pox vaccine will prevent roup. Unfortunately this is not the case. Avian *Staphylococcus aureus* or mixed bacterins of the proper kind will apparently prevent roup if used on birds that are free from other diseases, but they will have no effect on the progress of an outbreak of pox. Neither will pox vaccination prevent roup nor materially alter its course. This statement is made in view of the fact that in the course of the studies at the Michigan Station, birds immune to pox have contracted roup and one flock that has shown no roup in two years has had two outbreaks of pox. Another flock that had been vaccinated with mixed avian bacterins, and showed no signs of colds or roup whatsoever, came down with a general outbreak of pox about four weeks after the bacterin was given. Unwarranted and ridiculous criticism of the cutaneous method of vaccination may result from ignorance of the nature of poultry diseases and the various immunizing agents. This fact was brought out by one man who related that he had been told by a neighbor that if he had used a needle instead of a swab for vaccinating his chickens he would have had no trouble. In one community the rumor had become prevalent that feather-eating was caused by vaccination.

The writer and his immediate collaborators in this work have vaccinated about fifteen thousand chickens, young and old, many
of them during severe winter weather, without encountering serious trouble.

Thus, considering our experience with fowl-pox and roup immunization, it seems evident that a considerable part of the difficulties encountered was due to lack of training on the part of those who took it upon themselves to diagnose the diseases concerned and administer the immunizing agents.

ACKNOWLEDGMENT

The writer wishes to express his thanks to the Larrowe Milling Company, Detroit, Michigan, which has cooperated so generously in our work with fowl-pox immunization.

REFERENCES


PRESIDENT LAM:

The next paper is "Brucella Disease in the Fowl," by Drs. M. W. Emmel and I. F. Huddleson, Michigan State College, East Lansing, Michigan. (Applause)

Dr. Emmel read the paper. . . . (Applause)

BRUCELLA DISEASE IN THE FOWL*

By M. W. EMMEL and I. FOREST HUDDELESON

Michigan Agricultural Experiment Station

East Lansing, Mich.

The literature contains very little information concerning the pathogenicity of the species of the genus Brucella for the fowl. A brief review of this literature is rather interesting.

Dubois,1 in 1910, reported what appeared to him to be an epizootic of both an acute and fulminating nature among farm flocks of fowls caused by Brucella melitensis. Dubois was unable to isolate any organisms from the affected birds but he did find specific agglutinins for Br. melitensis in the blood sera in titres varying from 1 to 50 to 1 to 600. The sheep on the farms in question were found to be infected with Br. melitensis. His diagnosis, therefore, was based on the finding of specific agglutinins in the blood serum of the affected birds and evidence of the disease in sheep on the same farms.

*Journal Article 26, New Series, Michigan Agricultural Experiment Station.
Mohler,² in 1912, reported that "chickens have in only one instance shown small necrotic foci and petechial spots in the liver as a result of feeding cultures of Bacillus abortus." Zwick and Zeller³ (1920) were unable to produce infection in the fowl by repeated subcutaneous, intraperitoneal, intravenous and intramuscular injections of Br. abortus. Koegel⁴ (1923) made a serious attempt to determine the susceptibility of pigeons and fowls to Br. abortus infection. In both he was unable to produce any outward manifestations of infection through various injection routes or from feeding large doses of the organism. During the time of observation, which was from 2 to 4 months, he found agglutinins present in the blood serum in titres varying from 1 to 200 to 1 to 1000. There was a tendency for the agglutination titre to drop as the time after exposure increased. He was unable to isolate the organism from either the pigeons or the fowls.

This paper is more or less a summary of a group of experiments carried out over a period of two years on forty-eight apparently healthy birds, to ascertain the pathogenicity of the species of the genus Brucella for the fowl. Infective agents consisted chiefly of fourteen strains of the species of the genus Brucella of animal as well as human origin.

**AGGLUTININS DEVELOPED IN INJECTED BIRDS**

All of the birds injected intravenously with infective material usually developed specific agglutinins in their blood within two days and showed an agglutination titre in a dilution of 1 to 500 in at least seven days. Birds fed infective material showed considerable variation in the time required to develop specific agglutinins, in the time required to reach the agglutination titre peak, and in the time required for the blood again to show the absence of specific agglutinins. Often four to six weeks elapsed after the fall of the agglutination titre before death.

Birds showing an agglutination titre in a dilution of 1 to 25 are considered infected, as all birds killed at this particular period often showed macroscopic evidence and always showed characteristic microscopic lesions of the disease. Only two infected birds failed to develop specific agglutinins.

Clinical symptoms of the disease, the course of which varied in the experiment birds from 18 to 96 days, are paleness about the head, comb and wattles, progressive emaciation, diarrhea more especially in the early and late stages of the disease, and often paralysis shortly before death.
Macroscopic findings consist of an enlarged spleen in the early stages and an extremely atrophied condition of the organ in the final stages of the disease. The liver becomes mottled, pale and extremely friable. Occasionally small gray or light brown foci may appear on the surface of these organs. The lungs appear normal. The kidneys, at first congested and slightly enlarged, become normal in size but pale in color. The ovaries are inactive with many discolored ova. Necrotic enteritis, in which the wall is usually greatly thickened, prevails in the intestines and often large patches of complete necrosis of the mucosa are noted.

Microscopically, perivascular foci of hyperplasia appear in the spleen, lungs and liver. In the lungs these lesions often extend into the adjacent lobules while in the liver hydropic degeneration also appears, the latter usually early in the infection. Focal necrosis also may appear in the liver. The tubular epithelium of the kidneys shows cloudy swelling, which later becomes intermingled with necrosis, the latter prevailing at death. The ovary shows two distinct types of degeneration, one of which is attributed to the causative organism, while the other is considered a physiological degeneration due to faulty nutrition caused by enteritis and the changed environment of the birds.

**Causative Organism Isolated with Difficulty**

Difficulty was experienced in isolating the causative organism from most of the birds. The greater the length of time that elapsed between exposure and autopsy the less were the chances of isolation. At first this was thought to be due to the low aggressivity of the species of the genus Brucella in the fowl. Subsequent experiments, however, lead us to believe that the survival of the organism in the bird extends over but a short period and that a toxic substance is very likely produced, which causes the progression of the lesions.

The disease has been found to exist in five naturally infected flocks. Within the last two weeks two additional very suspicious cases have come to our attention but as yet we have been unable to obtain sufficient information on which to base a definite diagnosis. Although we have been unable to satisfy ourselves as to the exact source of the infection in these flocks, it is striking that all have occurred on farms on which the birds have been allowed free range and possible contact with infected animals. Routine examination of 2500 blood samples has revealed 5 per cent reacting to the agglutination test in titres varying from 1 to 25 to 1
to 200. Although mortality in naturally infected flocks may often be low, our observations lead us to believe that decreased egg-yield is no doubt of greater economic importance. Naturally infected flocks had a history of an average of 20 per cent decreased egg-production after the onset of the disease.

In view of the fact that all of the fourteen strains of the species of the genus Brucella failed to differ in their ability to produce experimental infection in the birds and that naturally infected flocks have been found, the authors suggest that the disease become known in the fowl as "Brucella disease." Our ability to diagnose Brucella disease has cleared to some extent cases which we have heretofore been unable to diagnose. We would suggest, however, that caution be used in diagnosing this disease, as there may be a tendency to use this disease to cover other conditions which may not be readily diagnosed.

In controlling outbreaks of Brucella disease, the agglutination test applied to the flock will weed out the greater number of birds in the first stages of the disease. These birds may be isolated and experience has proved that plenty of exercise and fresh green stuff is often beneficial. In certain cases it might be advisable to destroy these birds. Birds in the later stages of the disease can be diagnosed by clinical symptoms after it has been determined that the infection is present and might well be destroyed.

REFERENCES


Dr. Emmel then read "A Preliminary Report on the Susceptibility of the Turkey, Pheasant, Pigeon, Duck and Goose to Brucella Disease."

A PRELIMINARY REPORT ON THE SUSCEPTIBILITY OF THE TURKEY, PHEASANT, PIGEON, DUCK AND GOOSE TO BRUCELLA DISEASE*

By M. W. EMMEL, East Lansing, Mich.

Michigan Agricultural Experiment Station

In view of the preceding experiments, it was decided to determine if the turkey, pheasant, pigeon, duck and goose were susceptible to Brucella disease. Three species of the genus, used as infective material, were chosen at random without any particular regard for their pathogenicity for the fowl or other animal.

*Journal Article 27, New Series, Michigan Agricultural Experiment Station.
The birds of each species were grouped so that the causative organisms could be fed and injected intravenously into the different groups providing at least one bird as a control.

To date all but two of the injected birds have been killed. All birds killed developed an agglutination titre in a dilution of 1 to 500 in from three to seven days after injection. Microscopic lesions characteristic of those found in the fowl have been found in all of the birds which have been autopsied. The causative organism in each case has been isolated from twelve out of fifteen injected birds. Even though one cubic centimeter of a suspension of the causative organism in physiological salt solution was injected in each bird, it is surprising to note the very few colonies developing on most of the plates. This would indicate that even though large numbers of organisms are injected into the bloodstream, their survival is comparatively short and further strengthens the theory that toxic substances may be produced in the tissues of the bird.

None of the birds which were fed have as yet died but many are manifesting clinical symptoms and specific agglutinins have been demonstrated in the blood of most of them in titres varying from 1 to 25 to 1 to 500.

From present experimental data it would appear that all of the above-named species of birds are susceptible to Brucella disease, the turkey being most susceptible, and that the same strain of the species of the genus Brucella may vary somewhat in its ability to produce Brucella disease in the various species of birds.

PRESIDENT LAMB: We will now have the report of the Committee on Poultry Diseases. Dr. W. R. Hinshaw is Chairman, but the report will be read by Dr. Robert Graham.

DR. GRAHAM: By way of explanation, I might say that Dr. Hinshaw prepared the report originally and it was sent to the different members of the Committee for revision. The copy which I have is the final revision of the Committee.

. . . Dr. Graham read the report. . . . (Applause)

REPORT OF THE COMMITTEE ON POULTRY DISEASES

DR. W. R. HINSHAW, Chairman, Davis, Calif.
Dr. L. Van Es, Lincoln, Nebr. Dr. Frank Hare, Lexington, Ky.
Dr. Robert Graham, Urbana, Ill. Dr. G. W. Stiles, Denver, Colo.

Poultry disease control in America is progressing. The agricultural experiment stations and veterinary colleges are continuing to contribute to the literature now available on the subject; regulatory officials are adding poultry disease control to their duties as fast as possible; standardization of technic in the diagnosis and control of poultry diseases is being accomplished; and other organizations are following the example of this Association in giving special
attention to the subject of poultry diseases. Examples of this are the establishment of a Section on Poultry and the appointment of a Committee on Poultry Diseases by the American Veterinary Medical Association.

During the past year some contributions that are worthy of note have been made to the field of poultry diseases. The U. S. D. A. Bureau of Agricultural Economics has established a system of inspection of poultry products and you have just heard something of this work from Mr. Potts. An outstanding contribution to the field of poultry disease control is the establishment of a definite and safe means of prevention of fowl-pox by the cutaneous vaccination method just described by Dr. Stafseth. Credit for this goes to several experiment stations that have been concentrating on the problem for several years.

Drs. Emmel and Huddleston have just described Brucella disease, an infection in chickens, which had not been reported in the United States until it was discovered in Michigan. This is a contribution to both the field of poultry diseases and to the field of Bang's abortion disease.

One outbreak of fowl pest occurred in the United States during the past year, and this has apparently been successfully eradicated. Your committee wishes to commend Dr. F. R. Beaudette, of the New Jersey Agricultural Experiment Station; Dr. J. H. McNeil and his staff, from the New Jersey Bureau of Animal Industry, and Drs. J. R. Mohler, A. McBride and Hubert Bunyead, of the U. S. Bureau of Animal Industry, for their splendid work in diagnosing and stamping out this disease before it spread from one small section of New Jersey.

Space or time will not permit further review of the poultry disease situation, but mention should be made of the suggested change of the name of bacillary white diarrhea to pullorum disease; to the appointment by the Conference of Official Workers in Animal Diseases of North America of a committee to study standardization of the testing method for detecting carriers of pullorum disease, and of the progress made by the eastern laboratories in standardization of pullorum disease control methods.

Your committee has not had an opportunity to do much constructive work during the past year, but wishes to make the following recommendations and suggestions:

1. The World's Poultry Congress will be held in London, England, July 22-30, 1930. Your committee believes that this Association should be represented at the Congress and recommends that some member who plans to attend be appointed to represent the Association.

2. Your committee urges that every effort be made by members of this Association to encourage special research work on infectious bronchitis, leukemia and fowl paralysis. These diseases are causing considerable loss and much fundamental research is needed to find satisfactory methods for their control.

3. The cutaneous method of vaccination for prevention of fowl-pox has caused a need for regulatory officials to study ethical and legitimate methods of controlling the sale and distribution of fowl-pox vaccine, which is a live virus. It is recommended that provincial, state and federal officials study this problem and try to develop a more uniform method of handling and distributing the vaccine than is now used. It is further recommended that fowl-pox vaccine be distributed only under the supervision of a veterinarian.

4. This Association has repeatedly gone on record as favoring government inspection of poultry and poultry products. Your committee recommends that the Association continue its policy in this regard, and that it cooperate in bringing about more general supervision.

5. Avian tuberculosis is causing a large percentage of the losses from rejections in the lower grades of poultry where inspection service is practiced. Your committee recommends that provincial, state and federal officials continue to urge poultrymen to eradicate tuberculosis from their flocks and that every effort be made to prevent poultrymen from selling tuberculous fowls to the market except when sold subject to inspection.

6. A year ago, at the annual meeting of this Association, Dr. L. F. Rettger recommended the use of the name pullorum disease as a substitute for bacillary white diarrhea. Since then, two nationally known organizations have accepted this proposed change in nomenclature, and it has met with much favor throughout the United States and Canada. It is recommended that this Association
go on record as favoring the change of the name bacillary white diarrhea to pullorum disease and that members use the new name in all references to the disease.

7. Ever since this committee has been functioning, effort has been made to bring about standardization of the methods of control of pullorum disease. Each year suggestions have been made, and it has been gratifying to observe how these suggestions have been accepted in America as well as in some European countries. Last year the New England Conference of Laboratory Workers followed a plan outlined by this Association in attempting standardization. The results of that conference were reported at last year's meeting. In May, 1929, a conference of representatives from twelve United States and two Canadian laboratories met at New Haven, Connecticut, for a similar purpose. One of the outstanding accomplishments of this conference was the appointment of a committee to study antigens. This "antigen" committee has made some recommendations and your committee believes them to be of sufficient merit to incorporate in this report. They are given as an appendix to this report.

SUGGESTED OUTLINE FOR PULLORUM DISEASE ANTIGEN PREPARATION

The following is a tentative outline, suggested by the Eastern Laboratory Workers Antigen Standardization Committee, to be followed in the preparation of antigen for the macroscopic agglutination test until it is advisable to make necessary changes:

STOCK ANTIGEN

1. Use the three S. pullorum cultures selected by the Committee. (Obtainable from any of the laboratories participating in the conference.)

2. Media on which cultures are grown should be made as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat extract (Difco beef)</td>
<td>0.3%</td>
</tr>
<tr>
<td>Peptone</td>
<td>1.0%</td>
</tr>
<tr>
<td>Agar</td>
<td>1.5%</td>
</tr>
<tr>
<td>NaCl</td>
<td>0.3%</td>
</tr>
<tr>
<td>Distilled water</td>
<td>1000 cc</td>
</tr>
</tbody>
</table>

Adjust to pH of 7.2, tube and sterilize for 20 minutes at 15 pounds pressure.

3. Inoculation of media:

   (a) Transfer should be made from stock culture, incubated at 37° C. for 24 hours, transferred simultaneously into plain meat-extract broth and 1 per cent dextrose, lactose, maltose and sucrose broth, incubated 24 hours at 37° C. and inoculate the flasks of solid medium with the plain meat-extract broth culture, providing the sugar reactions check. In the tube containing the dextrose broth, acid and gas should be produced but no change in the lactose, maltose or sucrose, providing the culture is pure, should be noticed.
   
   (b) Dr. L. F. Retger (Connecticut) finds the following method quite satisfactory: freshly prepared Kolle flasks or Blake bottles containing a fairly thick layer of agar are streaked once along the middle of the surface; the flasks or bottles are then incubated until the following day, when the entire surface is streaked with a platinum loop or a special streaking device all over the surface.
   
   (c) Dr. R. E. Lubbehuisen (Pennsylvania) uses the following technic: freshly prepared Blake bottles containing enough agar for a thick slant are incubated for 48 hours at 37.5° C. in order to check on possible contamination. After this period of incubation, the water of condensation of each flask is inoculated from agar slant cultures and returned to the incubator and placed on a slight angle. After 24 hours of incubation, the flask is gently rotated until the entire surface of the agar has been covered by the inoculum. After this surface inoculation has been made, the flasks are incubated for 48 hours.

Note: The committee suggests that it be optional with each laboratory worker as to which of the three methods (a, b or c) is used, but that in any case the cultures should be incubated at 37° C. for 48 hours before being used for antigen preparation.
4. The cultures should be washed from the flasks with sterile 0.5 per cent phenolated physiological saline, stained by the Gram method and examined microscopically for purity, making a stain from each flask.

5. Stock antigens should be stored in a refrigerator.

6. The maximum age at which a stock antigen should be used is four months. Stock cultures should be transferred monthly and kept at low room temperature or in a refrigerator.

**Diluted Antigen**

Antigens should be diluted in sterile 0.25 to 0.3 per cent phenolated physiological saline and adjusted to a turbidity of 0.75 to 1.0, as determined by McFarland's nephelometer.

The hydrogen-ion concentration of the diluted antigen should be pH 8.5 with the use of NaOH. (Add the NaOH to the amount of antigen to be used in only one day.)

The maximum age for use of the diluted antigen which has not been adjusted to a pH of 8.5 should be one week.

**DR. GRAHAM:** I recommend the adoption of the report, Mr. Chairman.

... The motion was regularly seconded and carried.

... The meeting adjourned at 12:30 p.m.

**ADJOURNMENT**

**FRIDAY AFTERNOON, DECEMBER 6, 1929**

The sixth session convened at 2:10 p.m., President Lamb presiding.

**PRESIDENT LAMB:** The program this afternoon is principally the reports of committees. Dr. Schalk, will you be kind enough to present the report of the Committee on Nutritional Diseases?

**DR. A. F. SCHALK:** Mr. Chairman and Gentlemen: Your Committee on Nutritional Diseases this year has followed the same plan that has been in operation for the last three or four years, that is attempting to bring up to date the literature, for the year previous, in this field of work.

We have done this in the form of brief reviews or abstracts, which I do not believe it will be necessary to read before this audience at this time. Therefore I move you, Mr. Chairman, that this report be not read at this time but printed in the proceedings of our Association.

... The motion was seconded by Dr. C. P. Fitch and carried.

**REPORT OF COMMITTEE ON NUTRITIONAL DISEASES**

**DR. A. F. SCHALK, Chairman, Fargo, N. Dak.**

Dr. Hubert Schmidt, College Station, Tex. Dr. Edward Records, Reno, Nevada
Dr. J. R. Beach, Berkeley, Calif. Dr. C. H. Stange, Ames, Iowa

**Nutritional Diseases of Cattle**

The factors governing the assimilation of calcium and phosphorus in ruminants have been the subject of many investigations, but at present have not been fully elucidated. There are apparently so many factors involved that it will take many years of research to determine all of them. It is known, however, that these two elements are intimately associated in many of the processes of body metabolism and hence both must be present in certain amounts to obtain the maximum benefit. To establish the optimum ratio between the calcium and phosphorus has been the subject of experiment in both the cow and the horse, the development or non-development of the characteristic disease in these animals experimentally furnishing the basis of proof.

Theiler and his co-workers found that the minimal requirements for growth are higher in the case of phosphorus than in the case of calcium and that a ration of P₂O₅ to CaO as high as 3 to 1 is not necessarily disadvantageous. These authors experimentally produced a true phosphorosis, locally known as styfseikte, in young, growing animals, by allowing a very limited amount of
CaO and \( P_2O_5 \). When the ration contained only 6.9 gms. of CaO and 5.1 gms. of \( P_2O_5 \), styfseikte developed in 9 months and death ensued after 16 months. The companion animal did a little better, but nevertheless after calving it went down rapidly and finally died. The calf was still-born.

A similar result was had when the CaO and \( P_2O_5 \) were increased to 15 gms. and 11 gms. respectively. In this case both animals developed styfseikte after calving. When the amount of these minerals was increased to 37 gms. of CaO and 28 gms. of \( P_2O_5 \), the animals remained healthy and reproduced healthy calves. Under the conditions of the experiment this allowance was higher than necessary, for another set of two animals run in the same experiment and receiving only 8.2 gms. of CaO and 19 gms. of \( P_2O_5 \) likewise did well and showed no signs of malnutrition. Both cattle, however, calved abnormally.

When the allowance of \( P_2O_5 \) was reduced to 5.1 gms. and the CaO increased to 29 gms., styfseikte again developed in both animals. One of the two animals died with a mummified fetus in utero, while the other animal gave birth to an abnormal calf. The inorganic phosphorus of the blood dropped much below normal even before clinical manifestations of styfseikte appeared, but the calcium content remained practically normal.

It is interesting to note that the more recent observations of the South African workers on the effect of phosphorus deficiency on breeding\(^2\) are on the same lines as those of American workers on calcium deficiency. Evidently phosphorus deficiency exists in varying degrees and only the more pronounced deficiency manifests itself clinically as styfseikte or osteomalacia. There can be no question but that lighter degrees of \( P_2O_5 \) deficiency exist and exact an annual toll from our agriculture, especially in the way of reduced calf crops, lower quality of calves and greater losses from disease.\(^5,6\)

A calcium deficiency just on the borderline seems to exist in many of our best milk cows. It could be shown that animals down with milk fever\(^4,5,6\) show a marked decrease in the blood calcium and when this is relieved by the proper administration of calcium salts prompt recovery takes place.\(^7\) Fish\(^8\) later could show that the blood phosphates in cows suffering from milk fever are also below normal.

With such examples of deficiency daily taking their toll, research workers have naturally set out in quest for methods of how best to overcome such deficiencies, especially as to which minerals give the best results. Experiments have been carried on with raw rock phosphate, phosphatic limestone (Fos-For-Us), calcium carbonate and bone meal. The choice of the mineral depends, of course, upon the lime and phosphorus content of the ration to be supplemented and upon the effect of the mineral upon the health of the animal. Where sufficient phosphorus is present in the ration, the addition of calcium carbonate alone may be expected to give satisfactory results and B. M. Anderson,\(^9\) reported such when finely ground limestone was added to a steer ration made up of cottonseed meal and non-leguminous hay.

Hart, Steenbock et al.\(^10\) also reported a favorable influence when comparatively large amounts of calcium oxide in the form of marl were added to non-leguminous rations for milking cows. Results obtained by supplementing the ration with raw rock phosphate have either not had any favorable influence\(^3\) or have proven injurious to the health of the animal.\(^11\) Especially when fed for a longer period of time, raw rock phosphate proved injurious to the teeth and had an unfavorable effect upon the digestive system. Phosphatic limestone, which is being marketed under the trade name "Fos-For-Us," when fed to rats, also showed an injurious effect upon the teeth. Tolle and Maynard,\(^12\) indicate that in both the raw rock phosphate and the phosphatic limestone (Fos-For-Us) the injurious effect upon the teeth must be attributed to the high fluorin content of these minerals.

When bone meal is used as a mineral supplement the results are much more favorable, indicating that the cow can more readily assimilate the lime and phosphorus from this product than from the raw natural rock deposits. This may in part be due to the absence of impurities from the bone meal, this product already having been purified by the animal, so to speak.

Of the other factors thus far discovered as influencing the assimilation of calcium and phosphorus from the feed, green grass still holds first place as a factor in keeping heavily milking cows in a positive lime balance on a ration.
rich in lime and phosphorus. Sunlight plays no role in the utilization of lime by cows and neither is the lime more readily assimilated when the cows are irradiated with ultraviolet light. Goats, however, when thus irradiated, assimilate lime much better. Cod-liver oil, when fed to cows, has improved the potency of the milk in its calcifying powers but it did not improve the calcium and phosphorus assimilation by heavily milking cows from a ration rich in phosphorus and lime nor did it improve a good dairy calf ration in this respect.

In recent years information has become available which seems to indicate that osteomalacia (ostritis fibrosa or osteoporosis) in horses is due to a calcium deficiency. Niimi and his co-workers were able to produce this condition experimentally by feeding horses on barley alone. On this diet osteomalacia would develop in about five months. When calcium carbonate was added to the diet osteomalacia did not develop. Attempts were made by this author to cure osteomalacia in the horse (a) by adding calcium carbonate to the basal diet, (b) by irradiating the basal diet with a mercury-vapor lamp for 15 minutes at 30 cm., and (c) by adding cod-liver oil in two doses of 20 cc each daily. Two natural cases and two produced on a barley diet were used. The addition of 0.052 kg. of calcium carbonate to a diet consisting of oats, 2.25 kgs.; hay, 7.5 kgs.; rice straw, 0.375 kgs.; and sodium chlorid, 0.037 kgs., dispersed the symptoms in 100 days. Regarding the cod-liver oil and the mercury-vapor lamp, an opinion is not clearly expressed. It would indeed have been interesting to learn the effect of the mercury-vapor lamp upon the condition in hand, especially since Schultze reported that vegetable oil containing phytoestrogen and irradiated with ultraviolet light, when added to feed mixtures in amounts of 5 to 10 per cent, cured florid rickets in colts and osteomalacia in cattle. Similar results were obtained by Sturgess who used a diet of wheat bran to produce osteitis fibrosa experimentally in horses. The data submitted show that two ponies (weight not given) consuming 6.8 and 9.16 gms. of calcium oxid respectively and 122 gms. of phosphoric acid developed the disease in about 9 months, but if the calcium oxid was raised to 19 gms. symptoms of the disease did not appear in 10 months. When the calcium oxid was raised to 19.5 gms. and the phosphoric acid reduced to 37 gms., the animal also remained healthy. It appears that the disease is due rather to the lack of calcium, and the author insists that the ratio of calcium oxid to phosphoric acid is the deciding factor. When this ration is as narrow as 1:2, good health will continue, but the wider it becomes, the more rapidly the symptoms will develop and the graver the lesions will be. Thus, in cases of a ratio of 1:5 the symptoms are not so marked, but when it was widened to 1:5.5 development of the symptoms was more rapid, but a ratio of 1:14 did not produce symptoms more rapidly than a ratio of 1:5.5.

The effect of a deficiency of other minerals upon the health of the animal has with few exceptions received but little attention. Theiler and his co-workers concluded from their carefully planned experiment that the sodium requirements for growth in cattle are very low, two grams of NaO being more than sufficient. Chlorid requirements are below 5 gms. per day, and a relatively high ratio of potassium to sodium is not productive of specific disease.

Greater attention has recently been given to the influence of iodin upon nutrition. The effect of a lack of iodin in food or water upon the development of simple goiter in man and animals is well known. This effect upon animals is sometimes so marked that in some instances 72 per cent of the calves are born with enlarged thyroids. When iodized mineral salt was fed to the milk cows, the number of calves born with goiter decreased to 2 per cent. The administration of salts of iodin leads to an iodinization of the body fluids and especially of the milk, as was shown by Scharrer and Strobel and Evvard. Scharrer and Strobel found that in the case of lactating cows the daily administration of iodin at the rate of 1.53 to 3.82 mgs. of sodium iodid had no definite effect upon the milk secretion, but when the amount administered daily was increased to 76 mgs., the daily milk yield was greater, but the percentage of butter fat was decreased. In the goat, daily doses of 60 to 120 mgs. of sodium iodid had no influence upon the daily milk yield, but when 180 mgs. of sodium iodid was administered daily, the milk yield was considerably increased, but the percentage of butter fat was decreased. The daily administration of sodium iodid in the doses given was without effect upon the health of the animals.
Small doses of iodin also exerts a favorable influence upon the gain in body weight, as was found by Golf and Birnbach in the case of Merino lambs. Doses of 40 mgs. potassium iodid, administered daily, increased the body weight over the control lambs, but the daily administration of 180 mgs. kept the weight below that of the control lambs. Chidester, Eaton and Thompson also have observed increased gain in weight in case of rats furnished a vitamin-A free diet. Hanzlik, Talbot and Gibson observed increased gain and growth in young rats on a complete diet, as well as in the rachitic diet of Sherman and Papenheimer, when iodin as sodium iodid was added in small doses, while Malke found that iodin in the form of sodium iodid or metallic iodin incorporated in the diet had a marked tendency to retard growth in young rats.

Milk, once considered the most complete food for growing young, is falling into disrepute, under the careful scrutiny of the scientist, at least in so far as ruminants are concerned, for it is now known that calves kept on a milk diet alone will show malnutrition with advancing age. This disturbance is variously described as anemia, convulsions, tetany and spasms. The Kansas Station reports that one calf died in spasms after being fed on a milk diet alone for 10 months and that two others became extremely nervous, which condition, however, was relieved by feeding wheat germ stock. A fourth calf in the experiment developed a case of severe anemia after being fed for one year on milk alone. This condition was relieved by feeding liver. Similar results were obtained at the Iowa Station, where a group of heifers fed cod liver oil, bone meal and iron citrate, in addition to the milk, became anemic and poor in condition, but a marked improvement occurred when alfalfa hay was added to the diet.

The vitamin-A requirements of ruminants have been briefly touched upon in the 1926 and 1927 reports of this committee. It was there reported that cattle apparently do not require an exogenous source of vitamins B and C and that vitamin B was probably produced by bacterial activity in the rumen.

Theiler reached the conclusion from recent experiments that the requirements of cattle for the vitamins A, B and C are so low that they are covered by a few pounds of poor quality roughage. Bechdel, Honeywell and Dutcher, continuing their studies in vitamin-A requirements for cattle, report the development of marked edema over practically the whole of the body when heifers 1 to 2½ years old were fed a vitamin-A deficient ration for 6 to 7 months. One of the animals went completely blind, but the condition of the eye did not resemble typical xerophthalmmia as seen in rats. Another animal would take fit-like spasms occasionally. She would stagger, fall down, and struggle violently until exhausted. After lying still for a time and recovering her breath, she would rise to her feet and go about in her usual peculiar manner. Cod-liver oil treatment was effective almost immediately. Two heifers on the vitamin-A deficient diet dropped calves during the experiment. Both were born dead but no evidence of blindness could be detected.

Cod-liver oil can prevent B deficienfy of a diet consisting of polished rice and rice straw upon the horse, as reported by Naito et al., were touched upon in the 1927 report of this committee. The Japanese authors have continued their study along the same lines and report the pathological anatomy of such cases, and in their more recent report additional detailed evidence of vitamin-B deficiency of rice as it affects horses.

LITERATURE CITED

COMMITTEE ON NUTRITIONAL DISEASES

460


Active yeast and taka-diastase possess the capacity of decomposing nucleic acid with the liberation of uric acid. Feeding hens active yeast produces an increase in plasma inorganic P and uric acid. Inactive (heated) yeast causes a drop in plasma inorganic P and a smaller rise in uric acid. The addition of taka-diastase to an inactive yeast ration makes it similar to an active yeast ration in so far as concerns the plasma inorganic P, uric acid, and protein fractions. The effect of a diet rich in nucleins on the inorganic P of the blood plasma may depend also upon the presence of foreign nucleases in the intestines. The effect on blood composition of the addition of phosphates and carbohydrates to an active yeast ration was also studied and discussed.


A study of the influence of mineral, cod-liver oil, alfalfa leaf meal, sprouted oats and sunshine supplements upon the hatchability, fertility and production of the egg. The quality of the egg as influenced by sunshine, cod-liver oil, germinated oats, alfalfa leaf meal and mineral supplement, and the value of rice by-products for laying hens are also discussed.


Curves were fitted to the feed-growth data and the age growth of a group of white Pekin ducklings. The relation between live weight and feed consumption was expressible as a diminishing increment, and the relation between live weight and age was described rather well by Robertson’s modification of the equation for the course of an autocatalytic monomolecular chemical reaction.

The testicular degeneration observed in pigeons fed a vitamin-B-deficient ration is not purely a starvation effect, since birds forcibly fed this diet may show severe degenerative changes at a time when the loss of body weight is negligible. Also pigeons dying from inanition but receiving vitamin B failed to show such severe degeneration. A control group of birds forcibly fed the deficient diet but which also were receiving vitamin B, showed histologically normal testes. Experiments on 2 groups of pigeons forcibly fed a vitamin-B-deficient diet, but which were receiving (a) the thermostable vitamin B$_2$ and (b) the thermolabile antineuritic vitamin B, indicate that vitamin B$_2$ is comparatively unnecessary for testis nutrition.

STUART. ANTRACHITIC VALUES OF COD-LIVER OIL, COD-LIVER MEAL AND FISH MEAL. N. H. Agr. Exp. Sta. Cir. 28 (1928).

A study of vitamin D from 3 fish sources in relation to the requirements of baby chicks shows that cod-liver oil and cod-liver meal are quite comparable in promoting growth and that fish meal does not furnish enough vitamin D for satisfactory growth. Cod-liver oil and cod-liver meal were fed in the ratio of 2 lbs. to 98 of mash, and fish meal was fed in a ratio of 5 lbs. to 95 of mash. Fish meal proved valuable as a supplementary source of vitamin D.


To a basal ration containing wheat for scratch, and wheat bran, shorts, cornmeal, ground oats and peameal for mash, with sour milk to drink, various vitamin-containing substances were added, and fed to laying hens. The hatchability of the eggs from the various groups was determined for a period of 3 years. The average results were as follows: basal ration alone, 28 per cent hatchability; basal + 2 per cent cod-liver oil, 43.3 per cent; basal + 2 per cent dry yeast, 34 per cent; basal + lawn clippings, 56.8 per cent. Since grains are high in vitamin E, the author concludes, "from the nutritional viewpoint a combination of factors is necessary for maximum hatching power."


The diet of polished rice for the production of polyneuritis in pigeons provokes an associated partial inanition. Serious toxic conditions are sometimes quickly removed when small amounts of beer yeast are administered. Digestive disturbances, loss of weight, reduction of temperature, loss of sexual instinct, bulbar and cerebral depression, etc., do not occur. Similar results are obtained using polished rice to which 1-1.5 gms. of sunflower seeds are added. Sunflower seeds constitute a natural satisfying and pleasing vitamin-B-free diet for pigeons and their use excludes non-specific disturbances which arise from the use of other diets.


In a series of three tests at the Indiana Experiment Station, two lots of chicks were compared to ascertain the effect of immediate feeding after placing in the brooder and of withholding feed for 44-48 hours. The same ration was fed to both groups in each series. The rate of growth was approximately the same up to the seventh or eighth week of age, with either method of feeding, and mortality was quite low in all groups. While this study does not show any harmful effects, especially digestive disorders, due to early feeding, it shows that early feeding has no advantage over withholding feed for 48 hours.


Egg hatchability not improved by wheat-germ oil. Chickens show need of vitamin E for reproduction. Soybean meal as good as meat scraps for chicks. Iodin fails to influence chick growth.

COMMITTEE ON NUTRITIONAL DISEASES

Soybean protein satisfactory for growing chicks.
Combination of meat scraps and dried buttermilk.
Protein requirements for young pullets.
Cod-liver oil stearin contains vitamin D.
Is germinated oats necessary?
Is the all mash method practical for layers?
Winter sunshine provides vitamin D.
Corn and soybeans are not a complete ration.
Soybeans as a source of protein for chicks.
Red corn contains vitamin A only when it has a yellow endosperm.

**Davis & Beach. The Antirachitic Value of Salmon Oil.** Poultry Sci., vii (1928), pp. 216-218.
The salmon oil used was extracted from cannery refuse, a considerable portion of which is the viscera of the fish. A group of 25 chicks was completely protected against rickets or leg-weakness by the addition of 2 per cent of this oil to the mash fed. A similar control group of chicks cared for and fed in an identical manner, but without salmon oil, developed lesions of rickets. The group that received salmon oil also made a 50 per cent greater gain in weight than the controls during 12 weeks.

A basal ration which produces good growth when supplemented with vitamin D or direct sunlight was fed to three lots of 40 7-day-old chicks each at the Nebraska Experiment Station. To the basal ration in lot 1 was added 2 per cent of cod-liver meal and in lot 2, 2 per cent of cod-liver oil. In a period of 8 weeks lot 1 increased from an average of about 50 gms. per head to about 425 gms. and 19 of the chicks died. Lot 2 increased from the same initial weight to about 550 gms. and only 2 chicks died, while in lot 3 the chicks grew to about 310 gms. and 25 chicks died.

In further studies a lot of 80 chicks fed a ration supplemented with 5 per cent of cod-liver meal increased from an average initial weight of 50 gms. to an average final weight of 300 gms. in 8 weeks and 6 chicks died. A similar lot, whose ration was supplemented with 2 per cent of cod-liver oil, increased to about 475 gms. per head and 5 chicks died; of the 74 remaining chicks in the first lot, unmistakable signs of rickets, while only 3 of the 75 in the second lot had rickets. From these data it was concluded that while cod-liver meal contains some vitamin D, even 5 per cent does not furnish enough of this factor to prevent rickets with a ration complete in every other respect.

From this work it has been calculated that the average hen requires 2.2 gms. of protein daily for maintenance except during the molting period, when 3.25 gms. daily are required. However, this requirement assumes that all of the protein is used, which is not according to known facts and it does not take into account the fact that the biological value of protein decreases as the level of nitrogen intake increases.

Rations consisting of natural foodstuffs or readily available commercial feeds which promote unusually rapid growth of chicks under laboratory conditions are described. About 10 per cent of the animals so fed developed leg-weakness, which was not rickets, nor were any indications of polyneuritis discovered. It was found that the amount of food required to produce a unit of gain on chicks with these rations was similar to the requirements of other animals at comparable stages of growth.

Nutritional leg-weakness in poultry; the effect of various protein carbohydrate rations upon the mortality, growth and condition of Single-Comb
White Leghorn chicks; the effect of different levels of animal protein, supplied by dried skim milk, on egg production, hatchability of eggs and condition of Single-Comb White Leghorn and Barred Plymouth Rock pullets are discussed.


It has been found that hens matured outdoors can survive the ordinary winter confinement and maintain heavy egg production with good rations, but without access to sunlight can not prolong the period without losing strength followed by a general breakdown. Exposure to sunlight before complete collapse resulted in rapid invigoration and return to laying and normal hatchability of eggs. Less than one-tenth of the sunlight available under favorable conditions and reflected light alone were probably sufficient to maintain good health during the year. Exposure to direct sunlight for a few hours once in 2 weeks has also been found to give favorable results.

Results of feeding tests indicate that no more than one-third of the ration can consist of coarse feeds, supplying about 10 per cent of the dry matter, without diminishing production.

**Nutritional Diseases of Other Animals**

Wood and Capstick ("The Scientific Basis of Rationing Animals," J. Agri. Sci., 18: 486-495) have worked out a formula, which allows the accurate rationing of farm animals for various purposes, such as milk production, work and growth.

Urbaneck ("The Calculation of Calcium and Alkali of Feeds on the Basis of Mineral Metabolism," Allatögyes Lapok., 52: 15-18) has worked out a simple formula by which the deficiency of calcium and alkali in feeds may be accurately determined and rather easily corrected.

Weiser ("The Calcium and Phosphorus Requirements of Farm Animals and Their Economical Supply," Fortschr. d. Landwirtschaft, 3: 490-498) has investigated the calcium and phosphorus needs of domestic animals. He concludes that under normal conditions a phosphorus deficiency is rarely involved; that the less hay or legume roughage is fed, the greater the calcium deficiency becomes. When there is no pasture available, pigs are always suffering from calcium deficiency. Calcium may be efficiently supplied by such compounds only which will not disturb salt balance of the body. The demand of the body on carbonate of lime cannot be expressed in figures but depends upon the amount of energy food given and upon the age of the animal. Pigs should receive 2 per cent of their feed in calcium. In rationing milk cows the equivalent loss of approximately 3 gms. of calcium carbonate per liter of milk should be considered. Calves and colts should receive 10-15 gms. of calcium carbonate per kgm. of energy food.

Bethke et al. ("The Comparative Nutritive Value of the Proteins of Linseed Meal and Cottonseed Meal for Different Animals," J. Agr. Rev., 36: 855-871) found the protein of linseed and cottonseed meal can be substituted for the proteins of cereal grains in the rations for calves, rats and fowls. Pigs show evidences of considerable toxicity for linseed and cottonseed proteins if fed in similar proportions as to rats.

Scheunert and Richter ("The Value of Soy Bean for Feed," Fortschr. d. Landwirtschaft, 3: 1130-1133) found that the soy-bean protein forms a balanced food for rats (confirmation of American investigations). The extracting of the oil removes vitamin A and such food has therefore to be balanced by vitamin A and mineral matter, which as a rule is supplied by the usual roughages.

Carlens ("The Influence of Beet Feeding on the Chemical Constitution of the Blood," Nord. Veterinaernote, 3: 777-791) found that beet tops contain large amounts of oxalic acid which combines with the calcium of the blood serum, causing a reduction in the coagulability of the blood. He considers this the explanation for the occurrence of grave and often fatal hemorrhages following the squeezing out the corpora lutea during periods of feeding sugar beet tops.
Maignon ("Influence of Seasons Upon Nutrition," Rec. Med. Vet., 104:513-518) cites experimental evidence that the basal metabolism shows two distinct maxima during spring and fall and two distinct minima occurring during summer and winter. The variations are not influenced by temperature.

Greene and Mellanby ("Vitamin A as an Anti-Infective Agent," British Med. Jour., No. 3537: 691-696) brought additional evidence that vitamin A must be considered as an anti-infective factor. Vitamin D does not have a compensatory action.

Voltz and Kirsch ("Detection of Anti-Rachitic Factor in Grass Grown in Artificial Media Under Darkness," Biochem. Zeitschr. 193: 281-284) prove that the curative substance for rachitis is formed by the metabolism of the plant, but is not taken from the soil by the roots.

Shol and Bennett ("Rickets in Dogs. Metabolism of Calcium and Phosphorus," Jour. Biol. Chem., 76: 633-642) found in rachitis due to calcium, the phosphorus balance is more disturbed than the calcium metabolism.

Siefried and Schaff ("Avitaminosis in Fowl," Arch. Tierheilk., 58: 357-374) give an account of the observation of nutritional roup in Germany.


Poenaru ("Alimentary Polyneuritis in Young Dogs," Bull. de l'Acad. Veter. de France, 1: 127-130) found symptoms of paralysis in two dogs following the feeding of vitamin-B deficient rations. He points out the difficulty of differentiating this disease from other paralyses and from rachitis.

Collarzo and Munilla ("Concerning the Pathogenesis of B. Avitaminosis in Dogs," Compte Rend. Soc. Biol., 99: 1448-1449) report experimental production of avitaminosis. A 40 per cent loss of weight was observed after 13 weeks. The loss of fat through the kidneys is considered of primary importance in causing the premortal cachexia.

Rote ("Contribution to the Study of Athrepsy (Marasmas) in Carnivora and its Treatment," Dissertation, School of Alfort, Paris) states that athrepsy in dogs during their first month of life is usually ushered in with indigestion. As a rule the animals appear weak and runty. Diarrhea and progressive emaciation follows. Quite frequently athrepsy is complicated with broncho-pneumonia, gastro-enteritis, icterus, scabies and edema. Autopsy reveals extreme emaciation and atrophy of all organs. Prognosis is favorable during the initial stage, but unfavorable when complications arise. Therapy: isotonic sea-water.

Dupre ("Contribution to the Study of Hypothrepsy and Athrepsy of Alimentary Origin in Young Carnivora," Dissertation, Vet. School of Lyons, France) considered as the main causes undernourishment, unsuitable foods, too early weaning and diarrhea from indigestion. The symptomatology of the disease is discussed.

Ball ("The Syndrome of Athrepsy in Animals," Lait, 8: 99-108) found that insufficient artificial nutrition will lead first to hypothrepsy and later to athrepsy. The symptoms are similar to those in infants. Nutritional disturbances have been observed in carnivora following feeding cows' milk and in calves feeding on skim-milk with the addition of sugar. These so-called dyspepsias of weaning animals have nothing to do with bacillary enteritis. The danger of too early and sudden weaning is stressed.

President Lamb: The next is the report of the Committee on Tick Eradication. Dr. Bux informed me he could not be present to give this report and that Dr. Williams would present the report. Is Dr. Williams here? (Not present)
We will pass that up for the time being, and ask for the report of the Committee on Miscellaneous Transmissible Diseases, by Dr. A. W. Miller, Washington, D. C.

Dr. Miller read the report.

REPORT OF THE COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES

DR. A. W. MILLER, Chairman, Washington, D. C.
Dr. H. Busman, Chicago, Ill.  Dr. W. H. Lytle, Salem, Ore.
Dr. H. C. Givens, Richmond, Va.  Dr. W. T. Spencer, Omaha, Nebr.
Dr. W. K. Lewis, Columbia, S. C.  Dr. F. A. Zimmer, Pataskala, O.

The report of your committee for this year deals with rabies, hemorrhagic septicemia and foot-and-mouth disease.

Rabies

The rabies situation during the present year has been far from satisfactory. Several states are requiring vaccination of dogs in infected districts and many cities have passed ordinances making anti-rabic vaccination of such animals compulsory. The single-injection method, the one commonly used, is accomplished through the administration of canine rabies vaccines which, if properly prepared, contain virus that has been killed or rendered avirulent to such an extent as to be incapable of producing the disease when injected subdurally into rabbits.

In recent years these killed vaccines have been used rather extensively in this country, 460,000 doses of this type of vaccine having been prepared by commercial houses in 1927 and about 305,000 doses in 1928. However, the many outbreaks which have occurred this year in widely separated localities indicate that too sanguine views were entertained by those who several years ago predicted that it would be possible to control this disease effectively through a more general use of the prophylactic vaccination of dogs.

Despite the extent to which this product has been used in the field, it is difficult to obtain exact data as to its effectiveness. As is the case with any biological product, it is not 100 per cent effective. Dr. Thomas G. Hull, Chief of the Division of Laboratories, Illinois Department of Health, in a recent article, reported that a study of the history of 452 rabid dogs showed that 18 of them had received prophylactic treatment for rabies previous to the outbreak of the disease. Ten of these 18 developed symptoms within one month after vaccination and apparently were in the incubative stage of the disease when vaccinated. Three developed symptoms three and one-half to six months after vaccination. These cases, Dr. Hull states, would possibly indicate a failure of protection by the vaccine.

An experiment to be conducted by the War Department in an attempt to obtain reliable data in regard to the efficacy of vaccination as a means of controlling and eradicating rabies should give us considerable light on this phase of the subject. The plans as drawn up by the Chief of the Veterinary Division, Surgeon General's office, of that Department, provide for the immunization of dogs at certain posts of the Army, the animals to be injected annually with a single dose of vaccine. This treatment is to be conducted over a period of ten years. At the time of vaccination an identification tag will be attached to the dog and a record of the animal, owner's name, date of vaccination, and number of doses used will be made. A check of this record will be made from time to time and each owner will be notified of the time for the yearly vaccination. This program should show whether regular and systematic vaccination of dogs under careful supervision is effective in the eradication or control of rabies in a given area.

Your committee is of the opinion that the failure to make headway in the campaign against rabies has not been due so much to the ineffectiveness of vaccination as to the failure to enforce other important control measures fully, such as rigid quarantine and relentless destruction of stray dogs. In other words, too much reliance has been placed on vaccination and not enough on
these other control measures, without which there can be no hope of success in the fight against this disease.

The federal Bureau of Animal Industry during the past year has been carrying on experimental work with vaccines killed or rendered avirulent by formalin, phenol and chloroform. A limited amount of work with formalin-killed vaccine did not indicate marked protective properties for this product. The phenol-killed vaccine was variable in its protective action, some lots appearing to afford a high degree of protection while others were lacking. Limited tests, however, with the vaccine killed by the addition of one per cent chloroform showed that it rendered dogs solidly immune to artificial exposure. Although the results obtained with this type of vaccine were excellent, the Bureau believes that further experimental study should be made before it is used in the field.

HEMORRHAGIC SEPTICEMIA

Hemorrhagic septicemia continues to cause rather heavy losses, especially during the fall and winter months, among feeder and stocker cattle shipped long distances. Additional knowledge is needed concerning this disease as it affects other classes of live stock and as to the manner in which it is spread.

Further research studies and experimental work confirm the view expressed by your committee in its report for 1926 that little or no immunity is conferred by bacterins or aggressin on animals in the incubative stage of the disease. Your committee recommends the immunization of feeder and stocker cattle with either of these agents when treatment can be applied at least ten days before shipment. On the other hand we feel that their use on these classes of cattle while in transit, or within a few days after they reach their destination, should not be encouraged.

FOOT-AND-MOUTH DISEASE

On the whole the world situation with respect to foot-and-mouth disease appears to be somewhat better in 1929 than during the preceding year. As usual, the disease is prevalent in most countries of Europe, Asia, Africa and South America. Australia, Canada, the Channel Islands, Finland, Ireland, Japan, Mexico, New Zealand, Norway and the Union of South Africa are reported as free from infection.

From January 1 to October 31, there were 32 outbreaks in Great Britain as compared to 120 for the same period in 1928. Prior to an outbreak which occurred on October 10, England was free from infection for a period of approximately four months, the longest time that has elapsed in that country without an outbreak for several years. Scotland, which had been free from the disease for a period of three years, experienced an outbreak on September 9.

The ninth outbreak of foot-and-mouth disease that this country has experienced occurred this year, the disease having been officially diagnosed on January 17, in hogs in a garbage-feeding plant in Los Angeles County, California. It was definitely determined that infection was introduced in meat scraps in garbage brought ashore from a merchant vessel that, while on a cruise to South America, had taken aboard a large quantity of meat at a port in an infected country. The spread of the disease was limited to five premises. This fortunate outcome was made possible by prompt diagnosis and vigorous and effective enforcement of all necessary eradication measures. The work was conducted jointly by county, state and federal officials. Only thirty days elapsed from the time the diagnosis was made in the first infected herd to the time the last diseased herd was slaughtered. In eradicating this outbreak 277 cattle, 3,291 swine and 23 goats, with an appraised value of $107,539, were slaughtered.

Dr. Miller: Mr. President, I move its adoption.

... The motion was seconded by Dr. A. T. Kinsley and carried.

President Lamb: Dr. Williams, will you please present the report of the Committee on Tick Eradication?

Dr. N. F. Williams: This report is rather comprehensive, in that the report of the state veterinarian of each state concerned is involved in this document. This project is one of the most vital projects that this organization has ever faced.
COMMITTEE ON TICK ERADICATION

This organization owes its inception to this problem of tick eradication. Tick eradication will be one of the accomplishments that will spread across the history of the veterinary profession and will reflect credit upon your profession. The men who have fought this battle in the last few years have largely fought the battle alone, but necessity, that wonderful mother, developed men equal to that occasion.

This report is summarized in Dr. Ramsey’s statement which I will read.

Dr. Williams read the statement (at end of report).

REPORT OF THE COMMITTEE ON TICK ERADICATION

Dr. J. H. Bux, Chairman, Little Rock, Ark.

Dr. C. A. Cary, Auburn, Ala.
Dr. R. A. Ramsay, Washington, D. C.
Dr. J. V. Knapp, Tallahassee, Fla.

Dr. N. F. Williams, Fort Worth, Texas
Dr. R. V. Rafnel, Jackson, Miss.
Dr. E. P. Flower, Baton Rouge, La.

The following reports on tick eradication from the state veterinarians of the various states are respectfully submitted:

ALABAMA—"We shall recommend, or have recommended, the release of Clarke County, Alabama, on December 1, 1929. We shall have a few infested herds in Clarke, Washington and Mobile counties. It will be necessary to work these next year; also, we shall be guarding next year the exposed Mississippi state line bordering on Mobile, Washington, and Choctaw counties."

ARKANSAS—"The popularity of the cattle tick eradication program in Arkansas was the cause of the failure of the Legislature of 1929 to make an appropriation. A deficiency proclamation was declared by the Governor in sufficient amount to justify inaugurating systematic cattle tick eradication in May in four whole counties and a part of another along the greatest exposed section of the quarantine line; thereby affording the maximum of protection to the tick-free areas and enabling progress. The systematic territory will not be ready for release until next spring or summer. The usual number of re-infestations were found in free areas and they are all under control."

FLORIDA—"The following counties are free of the cattle fever ticks and have been released from state and federal quarantine: Escambia, Santa Rosa, Okaloosa, Walton, Holmes, Washington, Bay, Jackson, Calhoun, Gulf, Gadsden, Liberty, Franklin, Loen, Wakulla, Jefferson, Madison, Taylor, Hamilton, Lafayette, Dixie, Martin, Palm Beach, Broward, Dade and Monroe. The counties of Suwannee, Columbia, Baker and Union have completed the work of tick eradication and will be released from state and federal quarantine on or about December 1, 1929. The work of systematic tick eradication was inaugurated in Nassau, Duval, Clay, Bradford, Gilchrist and Levy counties, March 1, 1929, and should be completed on or about July 1, 1930.

"The work of preliminary tick eradication, vat construction and quarantine fence-line construction is in progress at the present time and systematic tick eradication work will be inaugurated March 1, 1930, in the following counties: Alachua, Marion, Putman, St. Johns, Flagler, and portions of Lake and Volusia.

"With the completion of the work of tick eradication in the present systematic area, Florida should be approximately 55 per cent free of the cattle fever tick. The cooperation in the work of tick eradication by the Florida cattlemen is excellent. The only difficulty we experience in a more rapid progress of our work is the fact that our appropriation is limited to a special tax levy of one-half of one mill on the taxable property of the State. The State Live Stock Sanitary Board of Florida has adopted a policy of encouraging the introduction of pure-bred beef and dairy sires in the several counties of this State immediately following the eradication of the cattle fever tick. This work is handled by a special employe, who is designated as Veterinary Inspector engaged in final tick eradication and live stock improvement. During the last three years, we have interested the cattlemen of the 26 north and west Florida counties, freed of the cattle fever tick prior to December, 1928, in the purchase of approximately 405 head of pure-bred bulls and anticipate placing this fall
in the four counties to be released December first, enough more to make a total of at least 500 head in the counties between Jacksonville and Pensacola. This phase of our work has done more to sell tick eradication to the cattle people and others interested in the agricultural development of Florida than any other single activity sponsored by the State Live Stock Sanitary Board."

**GEORGIA**—"For the past several years—since the general release from federal quarantine—we have annually had some minor reinfestation. Most of these reinfestations occurred in counties bordering the infested area in Florida and were the result of illegal movements of cattle from the infested area. In every instance the infestation embraced a very limited area and the cattle-owners affected by our local quarantine and the enforcement of systematic disinfection cooperated with us admirably. The General Assembly of Georgia, recognizing the great value of tick eradication, has annually appropriated $25,000 to take care of minor reinfestations as they occur. Without this generous legislative provision, some of our reinfestations might have proven troublesome."

"Our experience demonstrates the necessity of rigid quarantine enforcement. The differences of cattle prices in the quarantined area as compared with the prices paid for cattle in the tick-free and released area offer a great inducement to unscrupulous people to blockade cattle across the quarantine line. Modern transportation methods make it comparatively easy to move cattle 100 or more miles in a very few hours under cover of darkness. But when tick eradication is well sold to the public, local interest will reveal the presence of ticks before they can spread very extensively."

**LOUISIANA**—"The situation in this State, regarding tick eradication, is just exactly today what it was a year ago. We are marking time awaiting the passage of a tick eradication measure at the hands of the next Legislature. From present indications and universal interest throughout the State there is no doubt at this time that this measure will be passed at the next session of the Legislature in May, 1930, and at which time is also hoped that the maximum amount of money requested, to satisfactorily carry same into effect, will be provided."

"There are 38 parishes and parts of three other parishes in quarantine, or in other words, inactive; 23 whole parishes and parts of three other parishes released from quarantine, or a total of 13,411 square miles released, leaving 31,998 square miles to be cleaned up of ticks."

"Under present law and conditions we have made no effort to do systematic tick eradication, realizing that it would be futile to expect satisfactory results where parochial officials are identified in tick eradication and where unsatisfactory complications militate against developmental progress."

"The new measure to be passed on by the next Legislature places tick eradication under state and federal control and it is hoped that the money will be provided, as asked for, to eradicate ticks practically in one season in each zone to be undertaken."

"We realize that this is a brief report, but it is a statement of true conditions and there is nothing further that I can add."

**MISSISSIPPI**—"With reference to the work of tick eradication I have the honor to report that the work in Mississippi has made very satisfactory progress during the year 1929."

"Late in the summer of 1928, the work of tick eradication was taken up in ten of our 23 quarantined counties in southeastern Mississippi, but the work was taken up too late in the summer to complete the eradication of ticks during the year 1928 and it was necessary to conduct dipping in these counties during the year 1929."

"In January, 1929, we had preliminary, systematic, and final tick eradication work in progress, embracing thirteen counties doing preliminary work, ten counties doing systematic work, and eighteen counties doing final work, or a total of 41 counties working in cooperation with the U. S. Bureau of Animal Industry and the State Live Stock Sanitary Board. During January and February of this year, 1,253 vats were constructed or repaired in Covington, Forrest, Greene, George, Hancock, Harrison, Jackson, Jones, Lamar, Pearl River, Perry, Stone and Wayne counties. In addition to this preliminary work during January and February, 1929, work was carried on by dipping all cattle
and dipping or inspecting all horses and mules every 28 days in Amite, Clarke, Jasper, Jeff Davis, Lamar, Marion, Pike, Simpson, Smith and Walthall counties; and on all known infested or exposed premises in the eighteen counties above the quarantine line doing final work.

"Beginning March 4, systematic dipping at 14-day intervals was inaugurated throughout the entire 23 quarantined counties, necessitating the employment of approximately 400 live stock inspectors and range riders to supervise the dipping in the 23 counties. During the month of April the program was well under way and resulted in the dipping of 446,641 cattle and the dipping or inspecting of 163,822 horses and mules.

"Cooperation throughout the entire area was very good with the exception of occasional dynamiting of vats and court injunctions. This opposition, however, was more or less restricted to small areas and did not affect the program materially. Beginning June 1, all live stock that had shown no infestation since August 1, 1929, in nine of the counties, which began tick eradication in 1928, were released from dipping and, after a careful inspection of these counties, we have been unable to locate any ticks in six of the nine counties. In the remaining three counties adjoining the Mississippi-Louisiana state line we have had slight reinfestation of ticks.

"The program has continued in the remaining thirteen counties and the report compiled by the Bureau office, on October 1, indicated that out of 320,095 cattle dipped during September, 71 head were infested with ticks, 29 head of which were in Rankin County and 24 head in Marion County. During the same period, 72,548 dippings and inspections of horses showed an infestation of 6 head. Regular systematic dipping will be conducted in these counties until December 20, at which time we expect to release from further dipping all live stock which have shown no ticks since August 1.

"At the meeting of the Live Stock Sanitary Board held on October 16, 1929, it was decided to adopt a policy of recommending for release from quarantine only those counties which have shown no infestation of ticks for a period of approximately six months or longer and, therefore, the Board recommended to the Bureau of Animal Industry, U. S. Department of Agriculture, the release from quarantine, December 1, 1929, of only six of the 23 counties which have conducted systematic tick eradication during the present year and which, according to our records, have shown no ticks since June 1 or prior thereto. The counties being recommended for release from quarantine are Amite, Lawrence, Jeff Davis, Simpson, Jasper and Clarke.

"At the present time we have 16 counties above the quarantine line in which sporadic outbreaks of ticks have been found. These herds have been placed under local quarantine and systematic dipping has been inaugurated at every point where infestation is known to exist.

"The problem of the construction of a cattle-proof fence along the Louisiana-Mississippi line has been a matter of considerable discussion during the year. The territory in Louisiana immediately south of the state line being an open-range, quarantined territory, the problem of preventing infested cattle from such territory roaming into Mississippi and spreading an infestation of ticks has given our line-riders considerable concern. It appeared to the Live Stock Sanitary Board that the only practical way of preventing such reinfestation was through the construction of a fence along the state line. This matter was presented to the extraordinary session of the Legislature during August, 1929, and the Legislature authorized the Live Stock Sanitary Board to reimburse the counties adjacent to the state line for construction of a double cattle-proof fence and cattle-guards over the main highway. These fences are now under construction along the entire line and in all probability will be completed by December 1. The infestation having been reduced to probably less than a half of one per cent, and with a very competent force of Bureau and State inspectors in charge of the work in the infested territory, we have every reason to believe that by January 1, 1930, the ticks will be practically eradicated from Mississippi and it will necessitate only a very small number of herds being dipped during 1930.

"In accordance with the plan above indicated, the Live Stock Sanitary Board expects to maintain a force of inspectors after December 20 sufficient to make inspections in the territory worked during 1929 and, if no infestation is
found in such territory, recommendations will be made for the release of the entire area, effective July 1, 1930.

**OKLAHOMA**—"The state of Oklahoma has been released from federal quarantine and we have made inspection in sixteen different counties since July 1, and have not found any ticks on inspection. The only ticks that have shown up in Oklahoma, since January 1, were in a small area in Grady County. Two animals were found ticky on March 1, on a place where we had a reinfestation last year. We had reinfestation in Delaware County, two miles west of Siloam Springs, Arkansas, which were shipped in on cattle from Louisiana.

"The entire state will be released from state quarantine with the exception of the local quarantine in Delaware County, December 1."

**TEXAS**—"The Texas situation is as follows: counties proposed for release: Red River, Wood, Upshur and Bell; 3,379 square miles released; no counties re-quarantined."

(Complete report promised to be handed to the Secretary at the meeting.)

The following is a report submitted by Dr. R. A. Ramsay, Chief, Tick Eradication Division, Bureau of Animal Industry, Washington, D. C.

"In further reference to your letter of October 7, requesting formation for the tick eradication committee report to the United States Live Stock Sanitary Board, the following is a report submitted by Dr. R. A. Ramsay, Chief, Tick Eradication Division, Bureau of Animal Industry, Washington, D. C.

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**UNITED STATES DEPARTMENT OF AGRICULTURE**

Bureau of Animal Industry

Washington, D. C.

Statement of Results—Tick Eradication—July 1, 1906, to December 1, 1929

<table>
<thead>
<tr>
<th>States</th>
<th>Counties Quarantined</th>
<th>Counties Released to Dec. 1</th>
<th>Released Counties Tick-Free On</th>
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<td></td>
<td>July 1 1906</td>
<td>Dec. 1 1929</td>
<td>Nov. 1 1925</td>
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<tr>
<td><strong>TOTALS</strong></td>
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<td>184</td>
<td>801</td>
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</tbody>
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Areas released from federal quarantine, December 1, 1929:
- Alabama, 1 county.
- Florida, 4 counties.
- Mississippi, 6 counties.
- Texas, 4 counties.

(Total: 15 counties released)

Areas re-quarantined, December 1, 1929:
- Louisiana, 1 parish.

40 additional released counties tick-free on November 1, 1929.
Association, regarding this year's activities in this project, we beg to advise, that as a result of the work by cooperating agencies, the following changes will be made by B. A. I. Order 321 in the federal quarantine area, effective December 1, 1929:

Alabama: Clarke County is released.
Florida: Baker, Columbia, Suwannee and Union counties are released.
Mississippi: Amite, Clarke, Jasper, Jefferson Davis, Lawrence and Simpson counties are released.
Texas: Bell, Red River, Upshur and Wood counties are released.
Louisiana: Jefferson Davis Parish is requarantined.

Very satisfactory progress also was made in finishing the work in areas previously released in which a small amount of infestation remains. This season, 40 counties were added to the list of released counties considered 100 per cent tick-free. These figures, as of December 1, 1929, will be as follows: 985 counties in quarantine in 1906; 801 counties released to date; 717 released counties tick-free.

DR. WILLIAMS: I move that this remarkable report be approved.

The motion was regularly seconded.

PRESIDENT LAMB: You have heard the report of the Tick Eradication Committee. I assume that the full text of this report will be published in the proceedings even though not read at this time.

DR. WILLIAMS: That was the idea.

PRESIDENT LAMB: It has been moved and seconded that this report be accepted. Are there any remarks upon the question?

DR. BAHNSEN: I observed in the report that new territory has been quarantined in the state of Louisiana. It is very regrettable that a few states do not seem to have the courage to go forward with tick eradication. I believe it would further the work materially if the federal government would quarantine against the movement of cattle from any state within the tick-infested area that is not doing active and aggressive tick eradication work. The time has come when we must finish the work of tick eradication. If one or two states hang back and furnish material for new infestation for other territory, it makes it expensive and troublesome to the states that have completed this work. I would, therefore, offer as a resolution that the federal government be requested to prohibit the movement of cattle from tick-infested and quarantined areas in states that are not actively engaged in tick eradication work.

DR. C. A. CARY: Mr. Chairman, I rise to a point of order. That would not be a part of the report of the Committee. I ask that the report of the Committee be accepted and that this be introduced separately, as it should be.

PRESIDENT LAMB: Does anyone wish to make any remarks upon the report of the Committee? If not, all in favor of the report of the Tick Eradication Committee will please say "aye," contrary, "no." The "ayes" have it, and the report is adopted.

DR. BAHNSEN: I should like to bring up the resolution as I just stated it. I should like to see this Association go on record as encouraging and requesting the federal government to use more or less coercive measures on states that are not actively engaged in tick eradication work.

DR. CARY: I should like to ask Dr. Miller if the Department could do that under existing conditions.

DR. MILLER: I was getting ready to get up and ask for some light myself. Dr. Bahnsen, I assume, would wish this to be carried out so that if a state has some clean parishes or some clean counties, the government would stop the movement of cattle out of those clean counties or parishes interstate.

DR. BAHNSEN: When a state is tick-infested and not doing active tick eradication work, one of the first places they fall down is in safeguarding the clean area within their borders. If they do not by quarantine measures safeguard their own territory, they should not move cattle from the clean area. Let them clean up.

DR. MILLER: I believe as long as that area is classed as free by the federal government, the Bureau itself would be unable to prohibit the movement of cattle out of the area. I do not believe legally we could do that. I should like to have Dr. Ramsay's opinion on that.
Dr. Ramsay: As I understood Dr. Bahnsen's resolution, he made it effective in the quarantined area. Wasn't that the way you stated it?

Dr. Bahnsen: That is the way I put it in the resolution. I even favor the restriction of movement from the entire state unless they get busy and do something.

Dr. Ramsay: I think it would be advisable to leave it as he first stated it, at this time. Of course, there is the legal question of whether or not the Department could enforce such requirement if they wanted to. But that, of course, would have to come up as a legal question later. I can see no objection to the resolution. I should like to see it adopted.

Dr. Cary: Mr. Chairman, I just came from a trip to Louisiana. I talked to a good many of the farmers and the legal authorities. I want to say that I never saw a more active body of men trying to get things to remedy the trouble they are in than right now. We might put a monkey-wrench in the machinery if we take action here. I do not say that they do not need this; I believe they do. Wouldn't it be better for us to sit down and let them do this just now, when they are waked up to it and are anxious to do it, trying to get all ways and means to do it? They may have a bad record. They spent $20,000,000 to clean up ticks in their state, and they have counties going back. I realize that is a bad condition, but they are awake as I have never known them to be. I know about the state. I make two or three trips into that state every year on account of personal interests, and I have never seen them in the condition they are in now. They are ready to go. Wouldn't it be wise for us to sit down a little? I like Dr. Bahnsen's idea, but we might put a monkey-wrench in the machinery. I should like to have the doctor withdraw that, because I know the condition is there.

Dr. Bahnsen: Dr. Cary, I cannot quite agree with you. I know from experience that some folks have to be made to do tick eradication work. If the state of Louisiana or any considerable number of the people in Louisiana are fairly well interested in tick eradication, they would require their general assembly to pass some sort of law and make some sort of appropriation to carry on this work.

The mere fact that the work has dragged on in Louisiana is they have done a little work in the northern parishes, as they call them there, and then they let it go back again for want of proper interest and proper quarantine enforcement within the state.

I believe if the federal government will go on record as prohibiting the movement of cattle from the tick-infested and quarantined areas in the states that are not actively engaged in work, it will help. If the state is actively working, there is no reason why the cattle should not move from the tick-infested and quarantined areas under proper restriction. If the state is unwilling to go ahead and make an effort to clean up the tick-infested area, I do not believe that the federal government should permit the movement of cattle out of the tick-infested and quarantined area. I should like to see the resolution passed.

Dr. J. W. Connaway: Mr. Chairman, this resolution and the discussion reminds me of some ancient history. The first meeting of this Association was called for the specific purpose of securing, by cooperative effort, better control of Texas fever. The federal quarantine line through Arkansas and Tennessee was located from forty to sixty miles or more south of the northern boundary of these states. Laxity on the part of the state cattle inspectors of the states named, in properly guarding the quarantine line, was believed to be the cause of outbreaks of Texas fever in Missouri, Kansas, Illinois and Nebraska. And at a conference of delegates from several states, a resolution was passed requesting the federal authorities to replace the quarantine line northward to the state line between Arkansas and Missouri, and between Tennessee and Kentucky. This was a penalty which the state authorities of the penalized states did not enjoy; but in spite of vigorous protests from the states concerned, Secretary James Wilson and Dr. D. E. Salmon acted in accord with the judgment of the conference. This movement of the quarantine line northward seemed a backward step in Texas fever control. It proved to be, however, a solid beginning of the movement to eradicate the Texas fever tick. In the present situation, however, with reference to Louisiana, I feel as Dr. Cary does.
that the matter should be handled in a tactful, diplomatic way rather than by imposing the penalty proposed in the resolution. Dr. Cary, from his personal study of the Louisiana situation, seems to believe that the sentiment in Louisiana is now strong and will grow stronger for vigorous tick eradication work. For this reason, Dr. Bahnsen, I hope your resolution will be voted down.

DR. MILLER: Mr. President, may we have the resolution read?

PRESIDENT LAMB: As I understand, it is to request the federal government to prohibit the interstate movement of cattle, not from clean areas but from tick-infested and quarantined areas, in states that are not actively engaged in tick eradication work.

DR. MILLER: Let us get that clear before we go ahead. Dr. Bahnsen, you mean, then, that no cattle should be dipped and moved out of any area within a state, that is quarantined.

DR. BAHNSEN: Unless the state is actively engaged in tick eradication. If the state is actively engaged in tick eradication, there is no reason why the movement should not go on, because they can clean the cattle and make it absolutely safe as far as any other state is concerned, or reasonably so.

DR. MILLER: But not permit the cattle to move out of non-quarantined areas of states not actively engaged in the tick eradication work?

DR. BAHNSEN: As I told you, as far as I personally am concerned, I would just as soon keep them from shipping any. The resolution itself just simply refers to the infected and quarantined areas.

DR. CONNAWAY: The impression the doctor made on me was that the resolution meant to quarantine the whole state.

DR. RAMSAY: As a matter of information for this Association, not over two hours ago the Executive Secretary of the Louisiana Tick Eradication Association (that is the association that is backing the proposition of getting adequate laws and appropriation for the work in Louisiana) was in this room. He has left town, and I am sorry he has. He said to me, "Try and get something to keep them from moving cattle out of our quarantined areas. That is one of the biggest levers we have to help us with our work. Close the dipping stations that you have there, and do not let them open any more." That was the sentiment of the man who is trying to put this work over.

PRESIDENT LAMB: As I understand this resolution presented by Dr. Bahnsen, it is exactly in line with the desire. Do you gentlemen understand the resolution sufficiently well? Are you sufficiently informed to vote upon it? If you are and are ready for the question, all in favor of the adoption of the resolution presented will please say "aye," contrary-minded, "no." The "ayes" have it and the resolution is adopted.

The next on the program is the report of the Legislation Committee by Professor H. R. Smith, of Chicago. He does not seem to be here.

The next is the report of the Committee on Policy, by Dr. T. E. Munce, of Harrisburg, Pennsylvania. Dr. Munce is not here. I have had some conversation with other Pennsylvanians who are here, and they tell me that they have no copy of this report and the Secretary has received none.

The next is the report of the Resolutions Committee, by Dr. J. I. Gibson, St. Joseph, Missouri. He is not here, and as far as I know he has not presented a report to anyone.

We seem to have come down to the end of our program. It would seem that the next order of business is the election of officers. The officers to be elected consist of a president and three vice-presidents. Nominations for president for the ensuing year are now in order.

DR. BAHNSEN: Mr. Chairman, I take great pleasure in nominating Dr. A. E. Wight, Chief of the Tuberculosis Eradication Division of the Bureau of Animal Industry, as President for the ensuing year. (Applause)

DR. W. F. CREWE: I second the nomination of Dr. A. E. Wight.

DR. T. H. FERGUSON: I move that the nominations be closed and that the Secretary be instructed to cast the unanimous ballot of this Association for Dr. Wight as President for the ensuing year.

The motion was regularly seconded, put to a vote and carried.
ELECTION OF OFFICERS

SECRETARY DYSON: I hereby cast the unanimous vote of the Association for Dr. Wight as President of the Association.

PRESIDENT LAMB: The next officer to be elected is first vice-president.

DR. N. F. WILLIAMS: A wonderful organization has held another wonderful and successful meeting. In ancient times, when pestilence threatened, the pilgrim journeyed to some far-off shrine or other place of association considered sacred, and there subjected himself in penance equalling perhaps self-inflicted torture.

That same religious fervor, reflected in another age, served to emphasize a spiritual power which, sweeping across the field of life, ended brute creation and established the sound foundation upon which the human race has flourished since.

From that time on, and in every age, we have lent an attentive ear to the cry of human and dumb brute suffering that has come to us down the centuries, persisting even as civilization has reached to higher planes. When it was discovered that the problems of the human family were closely related to the animal life, both past and present, logical relief measures were developed. The sanitarians came into their own. The veterinarian who had evolved through the ages with the things that revolved around him and depended on him, reached to higher levels, too.

This Association today, with veterinarians, with medical doctors, and with lay sanitarians, represents a high type of organization that is the real hope of civilization in the ages to come. That that hope may be held at its best, it is incumbent upon us to put in the leadership men who are seasoned, men who are devoted, men who perhaps are consecrated to the labor involved.

I have in mind a man in whose breast years ago Hope built her nest, and from season to season optimism has come from that nest, and that optimism has been reflected in the work of this organization.

In the twilight hours of a man's career, his judgment is more mature. For that reason I am going to nominate a charter member of this organization, who has labored from the day that this Association was born, has served through the different problems and different ages that have come upon us and have led to the success of the various projects that are now reaching their termination.

I place in nomination Dr. John W. Connaway, of Missouri. (Applause)

DR. CARY: Mr. Chairman, I want to second that nomination and make this motion, that the rules be suspended and the Secretary cast the unanimous vote for Dr. John W. Connaway as First Vice-President.

DR. BAHNSEN: I second the motion.

PRESIDENT LAMB: It has been moved and seconded that the nominations be closed and the Secretary be instructed to cast the unanimous vote of the Association for Dr. John W. Connaway as First Vice-President. All in favor of that motion please say "aye;" contrary-minded, "no." The "ayes" have it, and the Secretary is instructed to cast the unanimous vote of the Association for Dr. Connaway.

SECRETARY DYSON: I cast the unanimous vote of this Association for Dr. Connaway as First Vice-President.

PRESIDENT LAMB: Nominations are now in order for the office of second vice-president.

DR. WILLIAM MOORE: I am sorry North Carolina cannot nominate the Second Vice-President in the same terms Texas did, but with the same sincerity I nominate Dr. J. M. Sutton, state veterinarian of Georgia.

The nomination was regularly seconded.

PRESIDENT LAMB: Are there further nominations? If not, all in favor of the election of Dr. Sutton to the office of Second Vice-President will please say "aye;" contrary, "no." The "ayes" have it, and Dr. Sutton is unanimously elected Second Vice-President.

Nominations are in order now for Third Vice-President.

DR. FERGWSON: I will nominate Dr. Fitch, of Minnesota, for Third Vice-President.

DR. A. F. SCHRALK: I second the nomination.

PRESIDENT LAMB: Are there further nominations for Third Vice-President?

DR. MOORE: I move that the nominations be closed.
The motion was regularly seconded, put to a vote and carried.

President Lamb: I presume the Secretary is instructed to cast the unanimous vote of the Association. If the Association has already elected him unanimously, it is not necessary for the Secretary to do it again. That seems to complete the list of officers. Is there any new business to come before this Association, anything that might properly come under the head of new business?

This does not come under the head of new business at all, but I was very much in hopes yesterday, when Mr. Mercer was in the chair, that there would be quite an extended and interesting discussion on various matters. Of course, we all know that when a program committee draws up a program simply for a three-day session, they cannot include in that program everything that may be of interest to everyone. I am strongly of the opinion that if the Program Committee for the next meeting were to designate an hour or two, or even a half-day, to a discussion of subjects that are not on the program regularly, it would be of mighty great value. I have heard people say, and I have said it myself, "I wish I had heard Dr. So-and-so describe this, that or the other, that I did not get a chance to see him personally and talk to him about." But if we were to have an hour or two of open session, it occurs to me it would give members an opportunity to ask questions and make comments and discuss matters that would be of much interest to them, that cannot seem to be arrived at in any other way.

I would recommend to my successor and the Program Committee for the next meeting that they seriously consider devoting a small part of the time to an open meeting of that kind. I personally believe it would be of great value. In Dr. Wight, the newly elected President, in the room? Dr. Wight, will you please come forward? (Applause)

Dr. Wight, I am not going to make a formal speech, but it is a great pleasure for me to turn over the gavel to a man of your ability. I have no doubt that you will wield it for the good of the entire Association.

President Wight took the chair.

President Wight: Members of the Association: I feel highly honored in being selected for this important office. I assure you that efforts on my part will be the best that I have to give to this Association, to continue the very important work and wonderful organization that exists in this connection. I trust that every member of this Association will feel perfectly free to make suggestions and be as helpful as they can during the coming year to continue this important work.

Many things are coming to the front today in connection with livestock sanitary work that were not so near the front a few years ago. We will need the assistance, we will need the advice and aid of every member of this organization.

I shall do the best I can in my limited way to carry on the duties. With the assistance and management, I might say, of the able Secretary-Treasurer, I feel hopeful that we can continue without very many upsets.

I think the first thing to do at this time is to ask the vice-presidents to step forward and let them have something to say to the members. We shall be very glad to have Dr. Conaway, Dr. Sutton and Dr. Fitch come forward.

Gentlemen, we have three well-known men in these important positions. I know that you will be glad to hear from each one of them. I will be very glad to have them speak in order.

First Vice-President Conaway: It goes without saying that anyone who is elected to a position of this kind, in an association of this kind, even if he is a third vice-president (laughter), should appreciate it. Your laughter at Dr. Crew's humorous reference to the third position, which for a moment seemed to go begging, reminds me that at a meeting of this association several years ago, the president, the first vice-president and the second vice-president were all absent, and that the duty of presiding fell upon the third vice-president.

The importance of that position has thus been demonstrated in our own history. We of course do not expect a repetition of that history, but even if it should occur there can be no doubt that the sessions next year will still be conducted in the usual able manner. I wish to add that although vice-presidents
are as a rule looked upon as useless cogs in the machinery of an organization, unless an emergency arises, it is my view that the office carries with it duties and obligations to assist the president in every way we can during the entire year. Mr. President, my services are at your command. Fellow members, I thank you heartily for the honor you have conferred upon me. (Applause)

Second Vice-President Sutton: Mr. President, Fellow Members: It is indeed a pleasure to have the opportunity to attend the annual meetings of the United States Live Stock Sanitary Association. I never come to a meeting of this kind but what it makes a better man of me. We have an opportunity here to discuss our problems with each other, elbow with one another, and when we go back home we can put some of the new ideas and new plans into effect for the benefit of our live stock industry.

I deeply appreciate the honor that has just been conferred upon me and assure this organization of my humble services and sincere cooperation. I thank you. (Applause)

Third Vice-President Fitch: Mr. President and Fellow Members: During the years in which I have been connected with this organization, it has been a great source of pleasure and that which makes a man feel as if he belonged to an organization that had been doing something, to find and to know the power that this organization exerts, not only in this country but in foreign countries, in relation to the control of live stock diseases.

This point has been brought more to my attention during the past two years and during the last year than ever before. This organization is a real power in the control of live stock diseases in this country. I certainly appreciate the honor which has been conferred upon me, the election as Third Vice-President of this organization. (Applause)

President Wight: Thank you, gentlemen. Your assistance will be very much appreciated.

Dr. C. A. Cary: Mr. President, I want to have the honor of moving that we do now adjourn.

The motion was regularly seconded, put to a vote and carried. The meeting adjourned at 3:05 p.m.
APPENDIX A

SUMMARIZED REPORT OF EXECUTIVE COMMITTEE MEETING

Roll-call of member states and representatives who responded thereto:

Alabama . . . . Dr. C. A. Cary
California . . . Absent
Colorado . . . Dr. C. G. Lamb
Connecticut . . . Absent
Florida . . . . Dr. J. B. Knapp
Georgia . . . . Dr. J. M. Sutton
Idaho . . . . . Dr. A. J. Dickman
Illinois . . . . Absent
Indiana . . . . Absent
Iowa . . . . . Absent
Kansas . . . . . Hon. J. H. Mercer
Kentucky . . . Dr. D. E. Westmoreland
Maryland . . . Dr. W. G. Chrisman
Massachusetts. Hon. E. F. Richardson
Michigan . . . Dr. B. J. Killham
Minnesota . . . Dr. C. E. Cotton
Mississippi . . . Dr. R. V. Rafnel
Montana . . . . Dr. W. J. Butler
Nebraska . . . . Dr. C. H. Hays
Nevada . . . . . Dr. W. H. Hilts
New Hampshire. Absent
New Jersey . . . . Dr. J. H. McNeil
New York . . . . Dr. E. T. Faulder
North Carolina. Dr. Wm. Moore
North Dakota . . . Dr. W. F. Crewe
Ohio . . . . . Dr. C. McCandless
Oklahoma . . . Absent
Pennsylvania . . . Dr. H. R. Church
South Carolina . . Dr. W. K. Lewis
Texas . . . . . Dr. N. F. Williams
Utah . . . . . Dr. W. H. Hendricks
Vermont . . . . Absent
Virginia . . . . Dr. H. C. Givens
Wisconsin . . . Dr. C. A. Deadman
U. S. B. A. I . . . . . . Dr. U. G. Houck
Canada . . . . . Dr. George Hilton

Re-election of Secretary-Treasurer Dyson.

Discussion of regulations covering interstate movement of live stock.

It was moved that a special legislative committee of three be appointed by the incoming President to confer with the U. S. Department of Agriculture and the U. S. Bureau of Animal Industry with a view to securing the enactment of a federal law giving the various states more authority with respect to the formulation and enforcement of sanitary regulations to cover the movement of live stock and poultry into the respective states. Motion carried. (President Wright appointed the following members of the special legislative committee: Dr. W. J. Butler, Chairman, Helena, Mont.; Dr. Peter Bahnsen, Americus, Ga.; Hon. J. H. Mercer, Topeka, Kans.)

It was moved that the Association appropriate $1,000, or as much thereof as necessary, to cover expenses of the members of the special legislative committee. Motion carried.

It was moved to re-affirm the resolution passed during the 32nd annual meeting of the Association, with reference to the use of the term “accredited” and its application to poultry. Carried.

A resolution was offered recommending that the U. S. Bureau of Animal Industry assume jurisdiction and control over the production and sale of “antigens” now being used in making various serological tests. Adopted.

It was suggested by Dr. E. T. Faulder, New York, that representatives of each state make a special effort to secure new members.

Adjourned.

O. E. DYSON, Secretary.
APPENDIX B

REPORT OF THE COMMITTEE ON LEGISLATION

As the federal fund for tuberculosis eradication has been quite adequate during the past two years, your Committee has done nothing to increase the appropriation this year. Our activities during the past year have been confined to the securing of compulsory test legislation in Illinois, Iowa and Nebraska. Such legislation was enacted last spring in Illinois and Iowa, but the bill failed of passage in Nebraska largely because the western cattle-growing counties are not particularly interested in county area testing. Just as soon as the cattle-feeding states have regulations requiring feeding as well as breeding cattle to be tested unless such cattle come from accredited counties, there will be created in the cattle-growing counties of the West a desire to undertake the testing for accreditation.

Unquestionably as the work of accrediting counties nears completion in the Corn Belt, the states will tighten the regulations along these lines to prevent reinfection from the importation of feeding cattle.

For this fiscal year we have a federal appropriation of $6,361,040.00 and state and county appropriations totaling $12,154,226.00 giving a grand total of $18,515,266.00 for tuberculosis eradication. This is for both indemnity and operating expense.

There is needed a much larger appropriation in South Dakota, California and Missouri in particular. No doubt certain other states could use to advantage larger state and county funds. California has no indemnity fund and a change should be made in the state constitution to make this possible.

(Signed) H. R. Smith, Chairman.