Fifteenth Annual Meeting
of the
United States Live Stock
Sanitary Association

CHICAGO, ILLINOIS
DECEMBER 5 and 6, 1911

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NOTICE

OWING to the high cost of publication and our limited revenue, the proceedings have been condensed as much as possible without eliminating essentials.
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OFFICERS—1912

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Committee on Uniform Regulations
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Committee on Competitive Tick Eradication Work
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C. A. CARY, Auburn, Alabama.

Committee on Extension Work of International Tuberculosis Commission.
M. H. REYNOLDS, St. Anthony Park, Minnesota.
J. O. H. MOHLER, Washington, D. C.
Constitution and By-Laws

As amended and approved by the Association at the Annual Meeting, Chicago, 1909.

CONSTITUTION

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

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

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

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

BY-LAWS

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

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

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

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

Section 5. Any person engaged in live stock sanitary work for Federal, State, Territorial, County or Municipal Governments shall be eligible to membership in this Association, and any other person interested in live stock sanitation may be elected to active membership upon the recommendation of the executive committee and a two-thirds vote of the members present.
Section 6. Each application for membership shall be submitted in writing and shall be referred to the executive committee for consideration and recommendation of the Association.

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

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

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

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

Section 11. All proposals for the alteration of the constitution and by-laws shall be submitted in writing, and no alteration shall be acted upon until it has been referred to the executive committee and presented anew by them at the next meeting of the association.
Meeting called to order by the President, J. F. DeVine, at ten o'clock, Tuesday, December 5, 1911.

The President: Gentlemen, if you will please come to order we will now declare the fifteenth annual meeting of the United States Live Stock Sanitary Association open. I am very glad indeed to see such a representative audience here this morning, and particularly glad to have with us Mr. W. H. Sexton, corporation counsel of the City of Chicago, who will represent his honor, the Mayor of the city, in welcoming us to the city. I take pleasure in introducing Mr. Sexton.

Mr. W. H. Sexton: Mr. President and gentlemen of the United States Live Stock Sanitary Association: I have the honor of appearing before you gentlemen this morning as the official personal representative of Carter Harrison, mayor of Chicago. As you gentlemen might readily believe, the duties of Mayor of this city are very great, and because Chicago is becoming a great convention city, the Mayor receives a great many invitations to appear on behalf of the city to welcome guests to the city. It is almost a physical impossibility for him to do that with his other duties. This morning, as his representative, I have been asked to appear before your honorable body, and also before another convention which is being held at the Auditorium. Now, that is not an onerous duty. It may be more or less perfunctory as the individual who appears may make it appear perfunctory; but if you gentlemen understood how anxious Chicago is to be recognized as a great convention city, you would believe that it is never perfunctory on the part of the city administration.

It is a great honor to have men from all parts of the country and in many cases international associations meeting in Chicago.
It is a great stimulus to trade, it is a great recognition of a great city. Now, gentlemen, I do not know what the city administration or the representatives of the citizenship of Chicago can do to make your stay more comfortable or more pleasant or more beneficial to you. On behalf of Chicago I extend to you a hearty welcome, and if on any occasion the Mayor or his cabinet officers of any of the representatives of the city can do anything for you, collectively or individually, gentlemen, you will honor us by calling upon us for that assistance.

Now, it is a trying thing, and I presume it is to some extent quite incidental, because in glancing over the report of your last convention I saw that the problems discussed by your Association are indeed important subjects, and I presume that you have got many important subjects to discuss here today and tomorrow. I again welcome you to Chicago on behalf of the Mayor and the citizens of the city, and hope that your stay may be pleasant, and that on your return you will find your affairs prosperous at home and at your office.

The President: Mr. Sexton, I am sure such words can do nothing but honor our meeting, and we will ask our colleague, Dr. Ravenel, to respond to your address of welcome.

Dr. M. P. Ravenel: Gentlemen, Mr. Sexton, representing his honor the Mayor. It is an exceedingly pleasant task which has been given me to respond to your address of welcome, and I do not think that the Mayor could have sent a better man than the Corporation Counsel, and, although he did not say so in so many words, he has virtually promised us that if any of us get full tonight he will look after our interests.

Mr. Sexton: That is what I meant in part.

Dr. Ravenel: He has told us something about Chicago as a convention city. The meeting of this United States Live Stock Sanitary Association is a particularly fit subject for Chicago. Chicago is the center of the cattle industry of the whole world—not only of the United States, but of the world. There we have the practical the every-day side of it, the business side of it which every one is interested in. No less important, however, is the scientific side, the safeguarding of that cattle trade when it comes to spreading contagious diseases, and the assurance that that food is fit for human consumption. Therefore, for a scientific body like this Association, a scientific body which also handles the practical side, Chicago
is the fittest place that could possibly be selected in the whole world for such a meeting.

Chicago, in addition to its natural advantages, has, especially within the last two or three years, been the recipient of gifts from wealthy people, I believe, second only to those given to the City of New York, and with the Sprague Memorial, with the Memorial Institute, with the Patten donations, the new institutions of scientific learning and research which have already been established and are being established in Chicago, we have on the one side the greatest practical field for material which the world affords, and on the other, scientific institutions and scientific men who are not surpassed in any part of the known world, giving educational facilities which cannot be equaled anywhere that I know of; so that Chicago is a peculiarly fit place for such an Association as this.

I wish to assure Mr. Sexton, and through him his honor the Mayor, that our Association appreciates his kindly words of welcome, and that we are more glad, if possible, to be here than they are glad to have us. I thank you very much.

Address of J. F. De Vine, President of the United States Live Stock Sanitary Association. Delivered at the meeting held on December 5 and 6, 1911, at Chicago, Ill.

Gentlemen:

As Presiding Officer of the Fifteenth Anniversary of this Association, I think I would be remiss in my duty and ungrateful to our co-workers if I failed to make commendable mention of the splendid meeting which our past President with the aid of our energetic Secretary made possible at our last meeting held in this city one year ago. Dr. Cotton well maintained and added to the established precedent that should be inspiring and encouraging as to the possibilities of an organization of this kind to those who are to follow in a work that is of such vast importance to the nearly five billion dollar live stock industry of our country.

I wish to express my sincere personal thanks to the valuable assistance rendered by our able Secretary and in his behalf I wish to say to the Society that if the maxim that the Secretary is the great factor in the success of a meeting was ever applicable, it truly is so of your present official.

In reviewing the past achievements of this organization with special reference to the assistance that it has given to the study and control of communicable diseases we need look back but a few short years to get a glimpse of the conditions as they then existed and how out of chaos and empiricism has come forth intelligent knowledge and order, when without such, we were oft compelled to stand by and watch the ravages of disease break down our wealth and deplete and impoverish our homes and our farms.

The progress is still more creditable when we compare the present
When we consider how methodical and general are becoming the methods of dealing with such scourges as tuberculosis, Texas Fever, Glanders, Rabies and Hog Cholera, and with what pride we can point to the effectiveness with which pleuro-pneumonia and foot and mouth disease have been wiped from our shores, it causes us to have faith in the statement credited to that great man Pasteur when he said "that it was within the power of man to eliminate infectious diseases from the face of the earth."

Our field of work covers many perplexing problems. It is not enough that a disease be known by a designated name and its clinical behavior, duration and degree of mortality be satisfactorily determined, but its true etiology, the study of surroundings and environment, and measures necessary for its control are the things vital to raise it from the real mot empiricism. Spencer says that "a learning of a business necessitates the learning of the science underlying that business." So it is with medicine. The clinician of today recognizes the indispensable post occupied by the laboratory worker in the application of scientific principles to the art of medicine.

It is needless, however, to dwell longer upon these generalities which I confess to me is much easier than it is to attempt to bring anything new or special to your notice. In casting about to find a theme which would seem appropriate for this occasion I read the addresses of some of your past Presidents, and after so doing, I saw that the field had been so thoroughly covered from so many viewpoints that I really had envy for Petruchio who had at least a definite object in view when he took unto himself the task of subduing a shrewish wife.

Some of my colleagues have suggested that a short history of the various communicable diseases that are giving us most concern might prove of interest to a majority of the members, and I have consequently attempted to give such, with the hope that if not of interest, it may at least refresh our memories on some important matters at the beginning of our deliberation: I hasten to add that much of the subject matter is not to my credit, but to different members of our organization who have given special attention to the subjects treated; and who have been good enough to furnish me either personal views or literature upon such subjects.

The consideration of these diseases is taken up in alphabetical order rather than with any idea of their relative importance.

**Anthrax.**

Anthrax is one of the oldest known infectious diseases. Some of the older writers described epizootics before their Christian era that were quite characteristic of anthrax as we know it today. It may be defined as a communicable disease due to bacterium anthracis, first vaguely described by Pollander and Davaine at about 1850. Cohn and Koch gave a more careful description of the morphology of these specific organism including spore formation about 1875. It is widely disseminated disease and may attack every species of domestic mammal. The continent of Europe has perhaps suffered most from its ravages. Historians record an outbreak of anthrax in Southern Europe in 1812, which started with cattle and spread from them to the populace, ultimately becoming a veritable scourge, causing the death of 60,000 people. From information of this character it would appear that
The disease was far more virulent and inclined to attack all species of animals during the earlier centuries than it is today. At the present time cattle and sheep are the chief sufferers and most of the outbreaks appear to be limited to animals that run upon low lands. It has frequently appeared in England, and evidence of its presence in Northern, Eastern and Central Africa, Siberia, Russia, India and Australia are also recorded. In the United States it has been reported from at least 15 states and territories. There seems to be no definite knowledge as to when it first visited this country, but Professor Law writes that “since 1892 anthrax has prevailed along the banks of the Delaware river for a distance of 40 miles in New Jersey and Delaware. The great morocca industry along this river draws infected hides from India, China, Russia, Africa and South America and the spores are carried and distributed by the hides.”

The methods of control have received much attention and have been steadily improved upon until today in localities where stockraising in the past has been almost impossible owing to the ravages of this disease; by insolation, proper destruction of carcasses (preferably cremation), disinfection of exposed areas and vaccination, the disease has been so satisfactorily controlled that it recurs only irregularly or in non-alarming outbreaks. The methods of vaccination have varied; one being what was known as the Minimum Dose, which consisted in an intravenous injection of a very limited amount of virus. Another was the injection of heated defibrinated anthrax blood; this method being followed by what was known as the Pasteur method, which consisted in inoculating the animal with a small quantity of culture which has been grown at a high temperature for several days. The latter method in one that seems to be looked upon with the most favor, when vaccination is begun early and before the appearance of the disease, but there is a strong probability of its being supplanted by the single vaccine, or where the disease is manifest in herd, by what is termed the simultaneous method, consisting in injecting anthrax antitoxin or serum together with vaccine.

Blackleg.

Although it was not until the last quarter of the past century that blackleg or symptomatic anthrax was recognized as a distinct disease, caused by specific micro-organisms, still there could be no doubt from the descriptions and post-mortem appearances given in many of the earlier epizootics designated as anthrax that they more exactly correspond with our present knowledge of blackleg than anthrax. Bourelle, in 1797, refers to a disease which he called mal de cuisse (quarter evil), because it affected the animal in the thighs. It was described clinically by Walraff in 1856, and in 1879 it was proved by Arloing, Cornevin and Thomas that blackleg is caused by a specific organism, and a year later demonstrating the fact, that the disease could be produced by inoculating susceptible animals with this organism, which has since been known as the bacterium charveaul. The Bureau of Animal Industry has given much attention to the investigation of this disease during the past few years and has found it to be more uniformly spread throughout the United States than was first thought. Its introduction into this country does not seem to be definitely known, but it is now stated that with the exception of the Southern Atlantic and Eastern Gulf states, that there are but few districts in the United States where the disease has not been observed.
The primary methods of control consist in laying great stress on isolation of the affected animals and the proper destruction of carcasses, using every known precaution to confine the spread of the virus to the smallest possible area; ever keeping in mind that the spores are very resistant, both to disinfectants and natural destructive agencies, such as sunshine and drying, these measures coupled with vaccine of all exposed bovines of a susceptible age, and the proper guarding of the non-exposed from infected areas.

Glanders.

Glanders is defined as a specific disease due to bacterium mallei, which was discovered and isolated almost at the same time (1882), by Loeffler, Schutz, Israel, Bouchard, Charrin, Weissebaum, Kausfeld and Kitt. Toussaint, in 1880, and Pasteur, in 1881, published results of investigations directed toward protective inoculation. It is universally admitted that glanders was the first disease of horses to receive the attention of classic writers, and for centuries this infection has been among the horses of civilized nations, appearing in most destructive form wherever the exigencies of war or the undertaking of any great industrial project necessitate the gathering together of large numbers of horses; the requirement of severe labor, and the constant change from place to place without the provisions of adequate shelter seeming to facilitate the rapid spread from animal to animal. In the United States it was largely confined to the northern states before 1861, but it spread over the south in connection with the Civil war and it is said to have entered Mexico with the American cavalry in 1847. Similarly Portugal is said to have been exempt until the invasion of Napoleon in 1797. Also Central Hindustan is said to have been free until the war of Afghanistan in 1878. In our own case the sale of horses and mules at the close of the Civil war produced a very general diffusion of this disease from which the country is still suffering.

At the conclusion of the war in Cuba, many cases of glanders were found among the horses and mules that had been gathered together for military uses, both among those that had been transported to the island and those that had been purchased and held in readiness on the mainland. Vigorous action was necessary to eradicate this outbreak from among the army stock, and it is probable that many centers of infection were established by animals that were dispersed when no longer needed, and that these centers still exist in various parts of the country.

At the present time the disease may be found in most if not all of the states of the Union. Wherever large numbers of horses are being used in railway grading contracts, in irrigation ditching, military duties, circus employments and the like, constant supervision of the animals is necessary to keep them reasonably free from this disastrous plague. In addition to these danger points in which many animals are involved in each instance, there are lesser infections in livery and sale stables, as well as in private barns where throughout the country the disease is sheltered and propagated.

Some years ago the idea gained credence that glanders could not persist among horses that were removed to the elevated and arid regions adjacent to the Rocky, the Sierra or the Cascade mountain ranges. Following this supposition, numbers of valuable blooded animals that had contracted the disease were sent to the ranges of this reputedly favored section.
result has been that many new centers of the disease were established by this method of procedure, for although few, if any cases of the fulminating type have ever appeared upon these elevated pastures, the disease has not lost its contagious properties, and large numbers of diseased animals are found upon these ranges each year.

We need not take into our consideration the bacteriology or symptoms of glanders, but should rather devote all our energies to the means of its eradication. All civilized countries have certain laws relative to the handling of cases of glanders, but these laws are not always enforced as promptly or as effectively as they should be. One drawback that has frequently been encountered in the past has been the disagreement of veterinarians and various interested parties as to the diagnosis in poorly defined cases. This lack of accord among the people connected with the case has often led to disastrous delay in the removal of diseased animals that during the ensuing arguments were continuously spreading the infection of glanders to the horses that came in contact with them.

The introduction of mallein as a diagnostic agent served as a great help in the suppression of the disease, but even this means of diagnosis, valuable as it is, has some defects, and it is now hoped that the great advances recently made through studies of blood reactions will lead to more decisive results in the detection of occult outbreaks. The study recently devoted to reactions of organic constituents from various animals when brought in contact with suitably prepared products of growth of different pathogenic bacteria as seen in Konew's precipitation test, and the remarkable reactions resulting from the combination of the blood of a hypersensitized animal with the blood of a normally immune animal, when used under suitable conditions as a means of detecting the presence of the disease with which the hypersensitized animal had been inoculated has greatly assisted in the work of eradicating glanders from suspected premises. This latter method is known as the complement diversion test and is an outgrowth from the Wassermann test for the diagnosis of syphilis.

Hog Cholera.

Moore, of Correll, who has given much attention to the history of swine disease in his work of infectious disease states the following:

"The earliest outbreak in this country, of which there is knowledge of a disease supposed to be hog-holera, occurred in the state of Ohio in 1833. It is presumed that it was brought from Europe with some of the animals imported for breeding purposes. After being introduced, it spread at first slowly, but later with increasing rapidity, until it invaded every part of this country where swine raising had become an industry. The disease was investigated and very carefully described by Dr. C. Sutton of Aurora, Ind., from 1850 to 1858. In 1861, Dr. Edwin M. Snow of Providence, R. I., contributed an important paper on this disease to the U. S. Department of Agriculture. In 1875, Dr. James Law of Ithaca, N. Y., furnished to the same department a valuable paper setting forth the symptoms and morbid anatomy of this disease. He believed it to be contagious, although the specific organism had not been found. The U. S. Commissioner of Agriculture appointed in 1878 nine men for a period of two months each to investigate the disease in various localities. In their report the symptoms and morbid anatomy formerly described were confirmed and two additional features set forth.
Law showed that it was transmissable by inoculation to other animals, and Dr. Detmers described a micro-organism which he called bacillus suis and which he believed to be the specific cause of the trouble. Later, Detmers described his organism as a micrococcus. The work of investigation was continued under the direction of the Commissioner of Agriculture and finally, in 1885, the supposed specific organism was discovered by Salmon and Smith.

In 1886, Dr. Theobald Smith discovered a disease among swine which was identical to the German Schweineeseuche, both in its morbid anatomy and in the morphology and properties of its specific organism. In naming this disease the Bureau of Animal Industry called it, on account of its similarity to the German Schweineeseuche, swine plague and its organism the bacillus of swine plague, and changed the name of the disease described in 1885 to hog cholera and its organism to the bacillus of hog cholera. The changing of the name of the first disease described from swine plague to hog cholera has been the cause of some criticism and it has been credited with the responsibility of creating confusion. It has, perhaps, led hasty readers to a misinterpretation of these diseases and their relation to those described in other lands under different names. While the names assigned may not have been especially happy ones, the transfer of the term swine-plague from the intestinal to the lung disease must be considered as a fortunate occurrence, and one which tended to simplify and not to confuse.

In 1903, de Schweinitz and Dorset published the results of their investigation of a virulent outbreak of swine disease in southern Iowa. They found that there is an infectious disease among hogs in this country which cannot be distinguished clinically from hog-cholera and which may be reproduced by infecting with material which does not contain the hog-cholera bacillus; this was satisfactorily proven by them being able to transmit the disease repeatedly from one hog to another by subcutaneous inoculation of certain body fluids which had been proved by proper filtration and animal inoculation to be free from hog-cholera and swine plague bacteria. The lack of infectiousness of the filtrable virus for rabbits and guinea pigs as well as the slight disturbances caused ordinarily in the hog from subcutaneous inoculation of the bacillus cholerae suis as compared with intravenous injection, or the feeding of the same, was information determined by these investigations which was of great value for further study of this perplexing problem.

In the report of this work the investigators made the following statements: "The fact that this particular type of hemorrhagic hog-cholera is so similar in both symptoms and lesions to the ordinary acute hog-cholera, supposed to be caused by the hog-cholera bacillus, and that by our methods of inoculations, without the presence of hog-cholera bacillus, we have never produced a case of chronic hog-cholera, have led us to suspect that possibly in all outbreaks of acute hog-cholera there is some other agent besides the hog-cholera bacillus at work, and that in those cases of acute disease where the hog-cholera bacillus is found we have to do, not with a pure infection, but with a mixed infection by hog-cholera bacilli and the organisms which are responsible for the disease which we have just described."

In 1905 the results of an exhaustive investigation carried on by Dorset, Bolton and McBryde, were published by the U. S. Department of Agriculture, and the conclusions then reached corroborated the previous publi-
cations of DeSchweinitz and Dorset, as well as adding further detailed information, which in part was as follows: "Our experiments have shown that pure cultures of B. cholerae suis injected subcutaneously into hogs usually produce but slight disturbance, although after intravenous injections or feeding, a severe illness frequently results. The disease produced in this manner may present the symptoms and lesions seen in acute hog-cholera, but does not possess the characteristics of contagiousness, nor of infectiousness of the blood; nor are those hogs which have recovered from such illness immune when exposed subsequently to the natural disease. In regard to the experiments with pure cultures of B. cholerae suis, therefore, we may say that they demonstrate the very inconsiderable pathogenic power which that organism possesses for hogs, but they also show that the disease produced by that organism lacks several of the essential features of acute hog cholera."

"The experiments with blood serum derived from hogs sick of hog cholera and proven to be free from B. cholerae suis, show on the contrary, that such serum produces illness in hogs with great regularity upon subcutaneous injection, and, furthermore, that the disease thus produced possesses all of the characteristics of the natural disease, including symptoms, lesions, contagiousness, infectiousness of the blood, and immunity in those animals which recover. These results are in such striking contrast to those obtained by the use of unfiltered blood from sick hogs, that we are forced to conclude that there exists in the blood of hogs suffering from acute hog-cholera some virus other than B. cholerae suis, and that this virus is necessary for the production of that disease."

"Others are of the opinion that these investigations might suggest that we are dealing with a new disease rather than with a new etiological factor for hog cholera, and that until this infectious filtrate is obtained from animals from which pure cultures of B. cholerae suis were isolated from the organs, it seems unfortunate to consider it the cause of hog-cholera, since the experimental results obtained with B. cholerae suis are too convincing to relegate it without sufficient evidence, to the role of a secondary invader.

From all that had been demonstrated from these careful investigations, it was reasonable to suppose that if a practical method of protecting hogs from the filtrable virus should be discovered, the problem of combatting hog-cholerae at least the highly infectious form of that disease would have been solved. The modifications of the views regarding the etiology of hog-cholera necessarily carried with it changes in the plans for combating the disease and consequently the methods of immunization were directed against the filtrable virus, giving the B. cholerae suis secondary consideration.

The possibility of satisfactory control of this swine disease seems within reason, considering the results which are at present being obtained by immunization, with serum drawn from hyper-immunized hogs.

Texas Fever.

Texas fever is a specific disease of the blood of cattle, caused by the development and activity of a minute animal parasite known as piroplasma, bigeminum, which are conveyed to the infected animals by the cattle tick, called the Boophilus annulatus.
The place of origin of this disease is not known, but it has existed for centuries in some countries of Europe. It is also prevalent in some parts of Central America, Australia, North Africa, East Africa, Mexico, South America, South Africa, Ireland, Finland, Southern Russia, China, Japan, Java, Borneo, and the Philippine Islands.

It was probably introduced into the United States with the importation of cattle by the Spaniards during the early colonization of Mexico and the southern part of the United States. In 1868, cattle shipped into the northern states of Illinois and Indiana caused enormous losses which prompted the study and investigation of this disease. The great danger of allowing southern cattle to pass north during the hot weather resulted in the Texas fever quarantine line in 1891.

Considerable attention has been given to methods of control by state and federal authorities, out of which commendable results have been obtained and improved upon, year after year. It is now generally accepted that medicinal treatment of the sick animals has usually been unsatisfactory, except possibly chronic cases and those occurring late in the fall.

Authorities are pretty well agreed that if southern cattle are freed from the tick, that the danger of infecting susceptible cattle ceases. Furthermore, that the tick infests pastures only transiently, and that it will not mature except upon cattle or equines, that the extermination of the tick is possible and hence the disease caused by it is preventable. Having this information, all energy should be directed toward the destruction of ticks on cattle as well as their eradication from pastures. Among feasible measures to accomplish this may be mentioned (1) picking or brushing the ticks off, (2) smearing or spraying the animals with a disinfecting solution, (3) dipping the ticky animals in a vat containing a solution capable of killing the ticks without injury to the cattle.

To rid the pastures, perhaps the most practical methods known today are: (1) by excluding the cattle for a definite period, which will allow the ticks therein to perish. (2) by cultivation of the soil for a year without maintaining any ticky cattle, horses or mules on the ground during that period, (3) by burning off the grass where it is feasible. If the latter method is adopted, it is advisable to do so in the spring, as this allows the pastures to recover quickly. The methods known as the soilng method and the feed-lot method has for its object the ridding at the same time the pastures and the cattle of the fever tick. It is based on the length of time the tick lives on the cattle and the period required for the eggs to be laid and hatched, and the seed ticks to attach themselves to their host. This plan, as well as the one known as pasture rotation, is feasible where conditions would make it more practicable than some of the other methods.

Immunization of susceptible cattle: Immunization by blood inoculation, particularly in young animals is proving very satisfactory and bids to be of great value where cattle traffic is concerned. Immunization may be accomplished by introducing the microparasite of the blood into the susceptible animal and allowing them to perform inoculation in a natural manner. The preferable method, however, is the subcutaneous injection of a small amount of defibrinated virulent blood, to be repeated at proper intervals.
History of Tuberculosis.

Medical records indicate that tuberculosis is one of the oldest diseases recognized as affecting cattle and that before the Christian era the flesh of cattle affected with this disease was looked upon as unfit for human consumption.

The history of tuberculosis and the variance in opinions as to its contagiousness and later as to its transmissibility to mankind is very interesting. As early as the fourteenth century the flesh of tuberculous animals was excluded from the human food alike by the civil and the ecclesiastical laws of some parts of Europe. In 1702, Florinna described the disease and agreed with other authorities as to its being identical with syphilis. This brought about the destruction of all animals believed to be suffering with tuberculosis, the doctrine of which was held until the fallacy of it was proved about 1782. Opinions as to its contagiousness continued to vary until 1865, when Villemin showed that tuberculosis was due to a specific virus. He produced the disease in rabbits by inoculating them with tuberculous material from human subjects. Later he showed that the disease could also be transmitted by feeding or inhaling tuberculous material. These experiments proved the transmissibility of the disease from one species to another and was followed by the discovery of Koch, in 1882, of a specific bacterium. This led to the view that tuberculosis of all species of mammals was identical, which brought about renewed interest in the suppression and control of bovine tuberculosis, largely as a necessary safeguard to human health and life. This movement, which was noticeably begun during the latter part of the last century received quite vigorous support and rather widespread attention, until the announcement of the late Professor Koch at the Tuberculosis Congress, in London, in July, 1901, where he gave as his opinion that owing to the differences in virulence and culture of the two types (a fact that had first been observed by Dr. Theobald Smith in 1896), great danger of transmissibility was highly improbable. Further inquiry into this important phase of the subject seemed to give evidence that would warrant conclusions at decided variance with the opinion of this great man. In a recent report of the Research Laboratory of the Department of Health of the City of New York, Dr. Wm. H. Park gives result of the study of some 500 cases of human tuberculosis that have been examined during the past three years to determine the nature of the infection, which would tend to prove that about 10 per cent of all fatal cases of tuberculosis in infancy is due to bovine infection. Dr. Park further states that in those using cow's milk which had not been pasteurized there was a larger percentage and adds that they found that about 25 per cent of glandular tuberculosis in children is due to bovine infection, but in adults examined, the percentage of bovine infection was very small. In the final report of the British Royal Commission we find the following—that in the examination of the sputum of twenty-eight cases of pulmonary tuberculosis in young adults, two were positively bovine infection. The Commission further reports the examination of twenty-nine cases of primary abdominal tuberculosis—of these fourteen showed bovine infection; thirteen human, and two a mixed infection of human and bovine bacteria. The ages of the subjects showing bovine infection were from one to eight years. In connection with the study of the cause and characteristics of the disease, much thought has been given of late looking to the end of its prevention by vaccines. Efforts to vaccinate cattle against tuberculosis may be said to bear origin with the discovery of
tuberculin in 1890, when numerous workers attempted to immunize animals with tuberculin, as well as to produce a serum against tuberculosis by means of increasing doses. This method proved a failure. In 1892-1893 Dr. E. Trudeau was the first to announce that to produce an immunity against tuberculosis the living tubercle bacterium must be used. In 1894 De Schweinitz used living cultures with success upon guinea pigs. In 1901-02 McFadyean was the first to demonstrate that injecting living cultures into cattle tended to give protection against tuberculosis. In 1902 Von Behring, Pearson and Gilliland published results of systematically vaccinating cattle, later exposing them with control animals to infection and gave the results of careful post-mortem comparison. The method of Von Behring and that employed by Pearson and Gilliland was practically the same, excepting in dosage, and consisted of the intravenous injection of living cultures. Later the vaccine of Van Behring was put on the market under the name of Bovovaccine. Other experimenters have done considerable work along similar lines inaugurated by these pioneers, but it seems to be generally admitted that while a certain amount of protection is usually produced in the vaccinated animals, there is no certainty of absolute immunity and that sufficiently large doses are dangerous. The short or rather uncertain duration of the immunity conferred, is also an objection that must be improved upon if the vaccination of cattle is to be popular and practical.

Rabies.
Rabies is a specific, communicable disease, which can be communicated to all mammals by inoculation with the specific virus. This specific virus is present in the saliva of animals affected with the disease and is transmitted to other animals and persons usually by a bite. It may, however, be transmitted through the saliva without a bite, if there is an abrasion, in the same manner as any other inoculable disease. It is characterized by extreme excitability and other nervous disorders, practically always terminating in death.

Rabid virulence has also been observed in the upper renal capsules, in the urine, spermatic fluid and lymph. It has been stated by Friedberger and Frohner that the blood is never virulent. The possibility of its being transmitted through the placenta seems to have been established by several observed facts and by few experimental results. This question, however, is yet under investigation. Ferroncito and Currito have succeeded in infecting a guinea pig by inoculation of the spinal marrow of a young rabbit which was the offspring of a rabid mother.

A point which is of distinct interest to us seems to have been settled by Nocard, as he stated he has "never succeeded in transmitting hydrophobia by the digestive tract and even after animals have at different times ingested considerable quantities of virulent nervous matter." Among the experiments which he has made upon this subject, the following is particularly interesting: "Within two months a young fox had eaten, without becoming infected, the brain and spinal cord of twelve rabid dogs. He was, however, not refractory and had not acquired immunity, for later he died from hydrophobia which was inoculated by trepanation."

It would, therefore, seem safe from my present knowledge to conclude that without an abrasion infection through the digestive track would be improbable.
Rabies is by no means a disease of recent origin, since it seems to have been recognized as a distinct disease before the Christian era. Aristotle wrote of this disease in dogs. Other early writers who refer to it are Virgil, Horace, Plutarch and Ovid.

In the first century Cornelius Celsius recognized this disease in man and called it hydrophobia. The first appearance in this country seems to have been in the latter part of the eighteenth century, but literature of older countries goes to show that this scourge visited different localities of such countries at different periods for the past twenty centuries with evidence of its specific character.

The nature and cause of this disease, like many other specific diseases, were confusing and misunderstood by scientists and investigators until after the middle of the eighteenth century, when leaders in medical and biological sciences (Pasteur probably standing out most prominent of these), determined its specific character. It is regrettable, however, that many laymen still look upon this diseases with doubt as to its being specific. It is still more regrettable that this doubt is, in most cases, probably directly or indirectly due to the expressions of such physicians and veterinarians who have not been brought face to face with the dreadful phenomena of this disease. We, however, must expect such opposition until time puts the sciences of biology and bacteriology on a more firm footing.

From the present knowledge of Rabies it would appear that there is no communicable disease which is more easily prevented or eradicated since the infection is almost always transmitted by a bite and almost always by a dog. Measures of control would naturally consist principally in preventing spread from the canine family.

The rigid enforcement of the practical dog-license law, coupled with the proper seclusion or muzzling of all dogs of an infected area, for a time sufficiently long to cover the period of incubation, has given satisfactory results in certain localities and countries.

Great Britain furnishes interesting data as to the effectiveness of muzzling in the suppression of Rabies. In this country where the disease was comparatively widespread, it is now believed to be entirely free from infection, all of which was accomplished in less than a decade by the measures referred to above.

In reviewing the history of these few diseases, one cannot help but notice the rapid increase in our knowledge of the fundamental principles involved; which is so necessary in order to deal successfully with them. With the accumulation and evolution of our knowledge of the cause, means of dissemination and methods of control, we are constantly coming into possession of information that will guide us more intelligently and efficiently in our efforts to prevent loss to the animal industry of this country from disease.

If in our life work we are to be of the greatest aid to our state and our country, it is then the duty of each of us to be ever in possession of the most advanced truth, to the end that the American Live Stock Sanitary laws and regulations may come to share, if not to lead, in the great wave of modern knowledge and useful activities that "rolls with the tide that encircles the globe."
REPORT OF THE SECRETARY-TREASURER.

During the last year in addition to the usual routine correspondence there has been an increased correspondence with state officials and legislators working on new regulations and legislation in their respective states.

Special effort was made to secure wide recognition of the Association from the agricultural and livestock press. With this end in view, a select list of papers was made out on which were mailed bulletins and special notices regarding the work of the Association. These papers also received a copy of the fourteenth annual report, of which due notice was given. In this way public interest was aroused in the work of the Association.

Again I wish to urge our members to take a greater interest in the distribution of the annual report. We have received many letters expressing appreciation of our last report as a basis for work in legislation for states not yet thoroughly organized. The fact that less than 500 copies of the report go into the hands of state and local authorities is a serious reflection upon the interest in control work over the country. Each member of the Association is urged to make it his personal business to enlarge the distribution of the report. Only 1,000 copies are issued, every one of which should find a useful place.

This office can be made a helpful factor in advising officials in states where legislation has not taken definite form. With due allowance for difference in local conditions general principles applying to Sanitary Control Work in one state are in a large measure applicable to organization in new territory.

There has been a marked increase in the readiness with which state officials co-operate with this office in furnishing reports of conditions and progress in their states.

I present herewith my report as Treasurer covering period from November 30, 1910, to November 30, 1911:

RECEIPTS.

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Detailed items of receipts and expenses are attached herewith together with vouchers covering all expenditures.

All of which is respectfully submitted,

J. J. FERGUSON.
Secretary-Treasurer.
The President: We will now proceed with the regular program. The first paper is on "The Proper Organization of a State Live Stock Sanitary Commission," by Dr. W. F. Crewe.

THE PROPER ORGANIZATION OF A STATE LIVE STOCK SANITARY COMMISSION.

By L. Van Ess & N. F. Crewe, North Dakota.

Successful prevention of disease is for the larger portion dependant upon the intelligence and efforts of the live stock owning public. However, these factors are available only to a very limited extent and even if uniformly well developed it would require an additional motive in order to properly co-ordinate individual attempts.

The natural limitation of intelligence and willingness along sanitary lines as well as the need of co-ordinated action has called into action the powers of government as a disease fighting factor.

It is conceded that in the management of public affairs the protection of life and properties occupies a prominent place among the purposes of government, and in no instance is life and property more constantly menaced than by disease.

The efforts of government are expressed in the formation of distinct departments which devote their attention to public hygiene and sanitary police.

For so far as those departments are concerned with the sanitary supervision of live stock, they form in many countries and states part of that division of the governmental machine which is directly in charge of its agricultural interests.

On account of the many systems and methods in public administration, the manner of organizing live stock sanitary police establishments vary greatly, and it will be sufficient to merely give an outline of the principal requirements for efficient service and of the various directions along which public sanitation is or should be attempted.

In the primary organization of a live stock sanitary service, proper legislation is of prime importance. This legislation may be divided into two distinct types.

1. That which may be called basic, which establishes the sanitary organization, defines its duties and its powers. The various details must be set forth in clear cut and well defined terms, while the various legal technicalities arising from differences in constitutional laws must not be overlooked.

In connection with basic organization, one great factor involving the future efficiency of a sanitary service, must always be kept in mind, and that is the importance of centralized authority. For a given state there must be one central authority, whatever that be, which directs the work for the entire commonwealth.

The less that is left to the mercy and judgment of local authorities the better will it be, as otherwise uniformity in actions taken and methods followed will be lacking, and few factors are more fatal to efficiency as such inco-ordinated attempts.
2. This type of legislation can be classed as working legislation and is intended to define for so far as practical the duties of owners of livestock regarding the importation, traffic, etc., of animals and regarding the prevention and eradication of infection.

Like legislation of the first type, this kind also must be expressed in clear language, its provisions must be sharply defined and above all the measures prescribed must be as thorough as possible. Half measures are always exceedingly expensive in the long run.

The working measures are best devised by the central livestock sanitary authorities.

The most important factor in securing an efficient livestock sanitary service is a certain amount of latitude in the enforcing of regulations made when emergencies present themselves. It is probably contrary to some constitutions, but it is not possible to cover all contingencies by legislation beforehand, and hence laws should be so drawn as to grant the central authority the right to regulate.

A well organized and efficient sanitary police organization occupies itself along definite lines of action. Such intelligence regarding communicable diseases as the importation of livestock from without, the supervision of livestock traffic within, and the control of actual outbreaks.

Intelligence regarding communicable diseases pertains to the existence of disease both without and within the boundaries of the country or state, it occupies itself with the statistics of disease and issues reports on the information obtained and the work done.

In this country the intelligence regarding the existence of disease in various parts of the world is largely left to the livestock sanitary organization of the national department of agriculture, the information being obtained through the consular service, special field agents, etc.

As the same organization is also responsible for the sanitary supervision of interstate livestock movements, the intelligence relative to diseases existing within the country is also one of its functions.

The maintenance of laboratories for the purpose of diagnosing the various transmissible diseases also is a very important feature in the livestock sanitation, and should be part of the intelligence division of the livestock sanitary service.

Official reports must be complete and concise. They should cover all the work done by the service and a full financial statement must form a part of them. Full and honest reports are imperative if a livestock sanitary service is to obtain and retain the confidence of the public it is serving.

The issue of popular bulletins on important animal diseases also is a valuable adjunct in view of the fact that sanitation to such a large extent is a matter of education.

The sanitary supervision of livestock importation is a primary function of a country's sanitary police, and the central authority must be in position to entirely suspend importation of livestock from infected regions.

It must have at its disposal well arranged quarantine stations, where fresh importations can be kept under observation when such is deemed wise.
Important also is the supervision of live stock traffic within the country. By the improved methods of transportation the rapid and widespread dissemination of disease has become an ever present possibility, and if this avenue of infection is to be blocked a continual watch is necessary. The points to be considered here are the prevention of shipments from infected areas, disinfection of cars and stock yards, methods of shipping, etc.

In the control of actual outbreaks the sanitary police functions are three-fold: 1. The destruction of foci of infection. 2. The enforcement of local quarantine. 3. The protection of live stock by artificial immunity.

In the destruction of infection foci, drastic measures are frequently necessary or even imperative, and sanitary police authorities should be endowed with sufficient power to proceed promptly in the matter, as in many cases of specific infection the total destruction of diseased or exposed animals is the most economic means of prevention.

Whenever this method of controlling disease is to be put in operation there should be funds available for at least a partial reimbursement sustained by owners in the transaction.

The value of an infected or exposed animal may be questionable or even negative; yet, nevertheless, as it is destroyed as a means of protection of property or general welfare, it is just that the commonwealth should assume the liability.

The destruction of infection foci also includes the supervision over the disposal of carcasses and the disinfection of premises.

Enforcement of local quarantine regulations are likewise important sanitary police functions, and it should include the prevention of the sale of infected or exposed animals, or of animals suspected of being diseased or exposed.

It is evident that as long as the government has assumed some degree of responsibility in the matter of controlling infection, that the practice of artificial immunity should be included in its activities.

The promiscuous immunizing of live stock merely upon application of owners is not a function of a live stock sanitary service, but in the face of actual danger of infection it becomes so indeed.

For this purpose vaccines and sera should be prepared under the immediate supervision of the sanitary authorities. In view of the business ethics of our era it would not be safe to leave the manufacture of the agents used in the prevention of disease to powerful manufacturing concerns whose dividends are more dependent upon the propagation than upon the prevention of disease.

The live stock sanitary laws of states vary enormously for the different jurisdictions. They range between desultory legislation directed against some one disease in particular and legislation establishing a more or less complete sanitary service.

Inefficient organization is common, while the little there is, is not infrequently blighted by predatory party politics.
An attempt to describe the various systems and the history of their development in all states would be impracticable, and it may be of more use to outline the arrangement to which most states seem to be bound at the present time.

At the present stage of development of state live stock sanitation, the best results are promised by the establishment of a central body, board or commission, composed of both stock raisers and veterinarians.

If a maximum of good is to be accomplished the organization of the service must be as free as possible from political influences. The danger of political taint may be avoided by establishing a board composed of ex-officio members. Presidents of veterinary, breeders, live stock or dairy associations may be made members of this board. This would eliminate some of the disadvantages incidental to political appointment, but would have the one that the membership would be continually and too rapidly changed. A prolonged service as board members is an advantage, as it always requires a certain length of time for officers of this type to become acquainted with the requirements of the service.

Another reason of reducing the dangers of politics through executive appointment to a minimum is by providing for several years of terms of office, and by arranging them so that not more than one membership expires per year. By this arrangement there will always be a majority of older members on the board, and sudden changes of policy, so fatal to efficiency, and incidental to political upheavals are rendered more remote.

The Board once established, organizes the service, adopts its policy and elects its executive offices and others working under his direction. In the election of the executive officer the most important step is taken, as naturally he is the chief technical counsellor of the Board and he is by far most responsible for the working and efficiency of the service.

In the selection of the executive, training, experience and personality must be the guiding factors, while compensation should be in accordance with quality. The appointment must be permanent, as temporary appointments, as a rule, will never draw the best talent.

The authority of the Board must be ample, and the basic law should be so constructed as to enable the Board to take proper steps in all emergencies.

In addition to the organization of a central authority for sanitary police purposes, legislation covering reimbursement for animals destroyed for the eradication of disease, the production of immunizing agents, etc., is an important factor.

In the State of North Dakota legislative enactment for live stock sanitary control work has been drawn along the lines indicated in this paper.

The basic law provides for the establishment of a live stock sanitary board, and for the suppression and control of dangerous, contagious and infectious diseases of domestic animals. This board consists of five members appointed by the Governor for terms of one to five years, and their successors for a period of five years thereafter. Three of the members shall be persons who are financially interested in the breeding and maintenance of live stock in the state, and two shall be competent veterinarians who are graduates of some regularly organized and recognized veterinary college or university.
The board shall determine and employ the most efficient and practical means for the prevention, suppression, control and eradication of dangerous, contagious and infectious diseases amongst domestic animals in the state, and the board is authorized and empowered to make all such rules and regulations for the conduct of the business of said board as it may deem expedient.

In the event of a permanent regulation being established by the board it is enacted into a law at the first session of the legislature.

The publishing of the regulations established in some newspaper, or posting in five public places, shall be deemed legal notice to all persons.

The board shall elect an executive officer, who shall be a competent and skilled veterinarian and a graduate in good standing of a recognized school of veterinary medicine and surgery.

The executive officer of said board shall act as state veterinarian. He shall ascertain all information which he can obtain regarding the existence of contagious, infectious and epidemic diseases of animals, execute the orders, rules and regulations made by said board, and submit at the meeting of said board a detailed report of all work done by him and assistants during the period preceding said meeting.

The professor of veterinary science of the state agricultural college shall act as bacteriologist and consulting veterinarian to said board, and it shall be his duty to make bacteriologic or pathologic examination of all diseased animals or portions thereof, or of such material as may be forwarded to him by the said board or its duly authorized agents.

Authority is given to said board to take all steps deemed necessary to control, suppress and eradicate any and all contagious and infectious diseases amongst any of the domestic animals of the state, and to that end said board is empowered to quarantine any domestic animal which is infected, or which has been exposed to infection therefrom, and to kill any animal so infected; to regulate or prohibit the arrival in or departure from the state of any exposed or infected animal.

Provision is made in the event of the owner being dissatisfied with the decision of the board's agent as to the diagnosis and disposition of an animal, said owner may file a protest against the decision and be entitled to a consultation by three experts. In the event of the original decision being sustained the owner must bear the expense of the consultation. If the original decision is not sustained the expense of the consultation must be paid out of the fund appropriated for the board.

The board shall prescribe the method of and order the disposal of the carcass of any animal ordered killed, and it shall be the duty of the owner to comply with said order.

Authorizes the board to employ such officers, agents and assistants as it may deem necessary at a compensation fixed by the board, and to grant the same authority as agent of said board to veterinary inspectors of the United States Department of Agriculture.
Gives the board the same authority vested in justices of the peace to take depositions and to compel witnesses to attend and testify, and to administer oaths.

Gives the board power to call any sheriff, deputy sheriff, or constable to execute its orders, and prescribes that said officers shall obey the orders of said board.

Provides for an emergency fund in case of an epidemic that cannot be controlled by available funds.

Provides for a penalty for any violation of the provisions of the law, or any rule or regulation made by the board.

Laws have been passed providing for a partial indemnity to owners of animals destroyed for glanders or tuberculosis, the funds being created by a fraction of a mill tax.

A law has been passed creating a serum institute for the manufacture of such agents as may be useful and necessary in the eradication, prevention and control of tuberculosis, glanders, hog cholera, black-leg and other infectious and contagious diseases, and providing for the free distribution of said products under such conditions as are prescribed by the Livestock Sanitary Board.

A law has been passed to regulate the issue of health certificates for live stock, making it a misdemeanor and providing for the penalty for any person issuing a health certificate for live stock unless duly authorized by the Live Stock Sanitary Board.

In conclusion, will say that this form of legislation for live stock sanitary control work, in conjunction with appropriations for the necessary funds, gives the live stock sanitary authorities of North Dakota every facility desired for properly conducting this work.

The President: We have another paper on the program that should be read before the discussion of this paper is taken up, "The Province of the State Veterinarian in Sanitary Control Work," by J. I. Gibson of Iowa.

PROVINCE OF THE STATE VETERINARIAN IN SANITARY CONTROL WORK WITH OBSERVATIONS REGARDING THE RELATIVE ADVANTAGE OF THE STATE VETERINARIAN'S OFFICE COMPARED WITH STATE LIVE STOCK SANITARY BOARDS OR COMMISSIONS.

The province, powers and jurisdiction of the State Veterinarian are so varied and widespread that it would be folly for the writer to undertake, in a short space of time, to fully set forth the different phases of the official life and duties of a state veterinarian. One day's correspondence may cover the territory from the New England states to California, and from the Dakotas to Texas, and embrace all phases of veterinary education, animal husbandry, agriculture, and live stock business.

In this short paper, the writer will devote his attention to a comparison of the results obtained by a State Veterinarian who stands practically alone.
In the sanitary work of his state, as compared with the one whose work is supplemented by the assistance of a Live Stock Sanitary Board, or Animal Health Commission.

During the period from April 1896, to April 1902, I served the state of Iowa in the capacity of State Veterinarian, and in those days with practically no legislation defining the duties and powers of the State Veterinarian, and yet being held responsible for all matters coming under the head of Live Stock Sanitation, I found my way a rocky road to travel. We were then operating under the original bill that created the office of State Veterinarian in Iowa, giving the State Veterinarian control of contagious and infectious diseases among animals, and defining what constituted a legal official call, the expense of which might be paid for from the appropriation, but affording practically no guidance or assistance of any kind. For instance, the disease tuberculosis was not even mentioned anywhere in the statutes of the state, but notwithstanding this fact, we tested a great many dairy herds at the solicitation of the local boards of health, from whom all our legal official calls were required to eminate.

The State Veterinarians present will readily see what a strained position we were placed in. As I said before, without mention of tuberculosis or any procedure outlined as to the handling of reactors and the final disposition of the same. Assuming that all power was vested in me under the law, I quarantined all cattle reacting to the test with the proviso that they might be shipped to any abattoir within the state and there slaughtered, subject to post-mortem examination by the Federal Veterinarian, which procedure we still follow in the handling of all cattle reacting to the test. Occasionally, however, we have some trouble in convincing the owner that it is his duty to sacrifice his cattle that react to the test for the small remuneration obtained through this method of disposing of the same. At first, under this method, the packers paid practically full value for the class of carcass, but as the years passed by, they became less liberal in their price and classification of carcasses, as a result of which the owner did not receive nearly as much for the cattle, although beef was much higher in price. It was simply an instance where they were inclined to "kick a fellow while he was down," because there were no competitive buyers to take his part, Sioux City being the only slaughtering point in Iowa where stock for slaughter can be submitted to competitive bids. If it were not for the interstate laws, prohibiting the entering of a reactor into interstate commerce, our owners of reacting cattle could be benefited financially by shipping the animals to such slaughtering points as Chicago, and I hope the time is not far distant when the Federal Law can be so amended as to permit of the shipment of this class of stock to the more extensive slaughtering points under quarantine, where they will be subject to competitive bids, and where the owner will stand a better chance of receiving the actual value of his cattle in their condition when condemned.

We have practiced the Bang method of handling the better class of reacting cows, to some extent, but as a rule we find that owners do not care to resort to that method. The Bang method might prove satisfactory from an economical standpoint if practiced under well regulated sanitary conditions, but under ordinary conditions it is questionable whether satisfactory results will accrue.
Last month we tested some two-year-old heifers at the Orphan's Home in Davenport, whose mothers were condemned in a test while carrying these heifers in utero. The mothers were turned out and given the outdoor life entirely and the calves were allowed to nurse for a short period and then taken from their mothers. The calves were never stabled afterwards with other cattle, which might become a source of infection. In our recent test, three out of eight of these heifers reacted to the test, which is not a very satisfactory result. I may say that in our post-mortem on the mothers of these heifers, we have no record of tubercular udders.

In passing this question, I wish to state that I favor an appropriation placed in the hands of the Animal Health Commission, providing for a reasonable or partial reimbursement to the owner, and allowing the State Veterinarian to take charge of the reacting animals and their slaughter, the proceeds therefrom to be added to the appropriation. If this method were in vogue there would be long drawnout periods of quarantine, and all the other unpleasant experiences that go with such cases would be avoided. It seems to me the consumation of the work of the State Veterinarian would be much easier if provision were made to reimburse the owner to a reasonable extent for all animals condemned and destroyed in the interests of the general public, both as to animal health and human life.

Probably the main criticism of our former laws and province of the State Veterinarian under them, would be that too much power and authority was vested in one man.

Last winter, during the friendly rivalry for the appointment of State Veterinarian, a prominent citizen remarked that a man to make a competent State Veterinarian ought to possess a lot of good common sense. I at once agreed with the gentleman and tried to have him believe that one applicant in whom I was very much interested possessed this commodity in a large measure.

Our law provides that the Governor may appoint a number of qualified veterinarians as assistants to the State Veterinarian, upon whom the State Veterinarian can call for assistance at any time. In this connection, I wish to say that I am in favor of the assistants having just as much common sense as the State Veterinarian himself, because in their official capacity, they have to deal with the same perplexing questions and in order that their work may be correct, they are called upon to use the same good judgment in dealing with sanitary questions, and outbreaks of contagious and infectious diseases. I may say, however, that I believe the work might be more satisfactorily carried on if from two to six deputies were appointed to receive a reasonable salary, and to devote their entire time to official work assisting the State Veterinarian. The work of the State Veterinarian, if conducted in the light of the present knowledge of the profession, as to the character of diseases and the means of their spread, he will find himself from one to five decades in advance of the legislature and the people of his state. I do believe this applies to all states.

I was once informed by the appointing power that my work was too fine; that the people of the state would not ask for better sanitary work than I was doing twenty-five years hence. In the instance in question, I was attempting to put up a winning fight against the contagion of glanders, and requesting the destruction of animals whose clinical history and the mallein
test condemned, and yet there was a healthy possibility that the animals might be released and never succumb to the disease, or never reach the stage of the disease wherein they would become a real menace to the health of other animals. I replied that I would rather leave part of the work undone and so far as I went carry out the work to the fullest extent. I mention this as a question that has often come up to me as to how thorough we should be in dealing with contagion. Personally I believe that no safe compromise could be made with pathogenic germs. However, this is a very important question when applied to a state where the owner receives no remuneration for condemned animals. In other words, I believe the State Veterinarian should always duly recognize the rights of the property owner.

Our legislature at its last session passed a bill, Chapter 115, Acts of the Thirty-fourth General Assembly, creating an Animal Health Commission, composed of two veterinarians and two stock raisers, together with the State Veterinarian, who is chairman and executive officer thereof.

The duties of the Animal Health Commission is to make all rules and regulations for the prevention and spread of disease among animals, and the State Veterinarian's duty is to put these rules and regulations into practice.

The Animal Health Commission met in July and enacted a set of rules which as yet have not been published in pamphlet form. The most important of these rules are to be found under numbers 18 and 19, these two setting forth the requirements for the importation of live stock into the state of Iowa, also rules 20 and 21, which are supplementary to or explanatory of the foregoing rules 18 and 19:

The following rules were approved by the Executive Council on August 23, 1911, and took effect on that date.

**Rules and Regulations Governing the Importation of Live Stock Into the State of Iowa.**

**Rule 18.** The importation of live stock into the state of Iowa for dairy or breeding purposes is hereby prohibited, except when such live stock is accompanied by a certificate of health, including a record of the tuberculin test for cattle over six months of age and a record of the mallein test on all horse stock when shipment originates in states west of the Mississippi River, such certificates and tests to be made not more than thirty days prior to the date of shipment by a Federal, State or Assistant State Veterinarian or a graduate veterinarian whose certificate is approved by the authority having charge of diseases of domestic animals in the state from which the shipment originates. A copy of such certificate must be attached to the waybill for the shipment and a duplicate must be forwarded to the state veterinary surgeon at Des Moines, Iowa.

All cattle shipped into the state of Iowa for feeding purposes shall be accompanied by an affidavit, certifying that they will not be used for other purposes than feeding or slaughter, without first duly notifying the state veterinary surgeon, who shall have them tuberculin tested at the expense of the owner before being disposed of.

**Rule 19.** Detention and Inspection-Quarantine. In lieu of an inspection certificate as requested in Rule 18, live stock may be detained at a suitable
stock yards or other enclosure within the state nearest the state line, on
the railroad or highway over which they are being shipped, driven or hauled
and there examined at the expense of the owner, or may be shipped, driven
or hauled to their destination under quarantine at the discretion of the
owner, there to remain in quarantine until inspected and tuberculin or
mallein tested at the expense of the owner, and released by the state vet-
erinary surgeon. Such expense shall be a lieu upon the live stock. Rail-
road or transportation companies are required to notify the state veterinary
surgeon at Des Moines, Iowa, of any shipments of live stock entering the
State of Iowa, not being accompanied by certificates of health as required
by Rule 18.

Rule 20. Township trustees and local health officers of towns, villages
and cities are hereby authorized and instructed to seize and hold in quar-
antine all live stock in violation of above rules and to notify the state
veterinary surgeon at Des Moines, Iowa. The expense of the quarantine
and examination must be paid by the owner (or agent) of the quarantined
animals as prescribed by law.

Stock Exhibited at Fairs.

Rule 21. Rules 18 and 19 shall not be held to apply to live stock brought
into the state from other states for the purpose of exhibition at state, dis-
trict or county fairs; provided, that in the event that sales shall be made
from such exhibition herds, to remain in the state of Iowa, such stock so
sold shall first be submitted to inspection requirements set forth in rule 18
before the sale is consummated and the stock shipped to destination.

The latter part of my subject I can best present to you by telling you
how I feel as I am now trying to carry out the set of rules prepared and
passed unanimously by two of our most competent veterinarians and two
of our most successful stock raisers. The results in the relief to the relief
to the State Veterinarian when handling an obstreperous owner of diseased
stock are better than anticipated. The average citizen seems inclined to
obey these rules when he finds they are the product of the commission, on
which they had equal representation and the sense of relief that I feel in the
position of State Veterinarian being connected with and supported by the
commission, is greater than I can explain.

I believe the progress of sanitation has been stayed, because it was
looked upon as a theory and theme of the veterinarians and the M. D.'s and
the people had little or nothing to do with it. Now we find it different.
We find by our experience on the Animal Health Commission that the pro-
gressive live stock breeder believes in sanitation and is willing to abide by
any rule that his two co-workers on the Animal Health Commission have
supported and voted for. We feel sure we will make rapid advancement in
sanitary legislation because of the fact that live stock men are represented
in the movement as well as interested. They do not believe that their
friends, who are members of the Animal Health Commission, will support,
enact or coincide with any measure that is detrimental to their interests.
You know in former years when legislative committees appointed by the
State Veterinary Association attempted to secure proper legislation, the
first objection invariably met with was, it is a scheme on the part of the
veterinarian to create work, to secure a job and to get some of the farmers
money. We do not hear any of these remarks concerning the work of the Animal Health Commission. The rules and regulations of this commission have the force of the law, which fact causes the commissioners, both veterinarians and stockmen to consider well every advanced step that is taken.

In future the State Veterinary Association will make its suggestions and requests relative to legislation to the Animal Health Commission, and the legislature will listen more attentively to the suggestions made by the commission.

Sec. 2. Commission of Animal Health—how constituted and appointed—terms. There is hereby created a commission to be known as a commission of animal health, which commission shall consist of the state veterinary surgeon, who shall be the chairman and executive officer thereof, two veterinarians and two stock raisers, all of whom shall be appointed by the governor. The veterinarians shall possess the same qualifications required for the state veterinary surgeon. One such veterinarian shall be appointed to serve until June 30, 1912 and one until June 30, 1914 and thereafter his term shall be three years. The other members of the commission shall be appointed, one to serve until June 30, 1912 and the other until June 30, 1913, and as their terms expire their successors shall be appointed for a term of two years.

Sec. 3. Meetings—rules and regulations for prevention and spread of disease among animals. The commission shall hold at least two meetings each year, one in July and one in January, at the office of the state veterinary surgeon, and may meet at such other times and places, in the state, as may seem necessary. It shall have the power and authority to make such rules and regulations as it shall deem necessary for the prevention, suppression or against the spread of any contagious or infectious disease among animals in or being transported through or brought into the state, and may provide for the quarantine against animals thus diseased or that have been exposed to others so diseased, whether within or without the state. When such rules and regulations have been submitted to and approved by the executive council they shall be published and enforced by the veterinary surgeon and in the performance of his duties he may call to his assistance any peace officer.

Section 5. Compensation—expenses. The members of the commission other than the state veterinary surgeon shall receive as compensation for their services one hundred dollars each per annum, together with their actual and necessary traveling, hotel, and other expenses and in addition thereto the veterinarians upon the commission shall receive one hundred dollars each per annum for their services as members of the examining board. All of which shall be paid upon vouchers duly approved by the executive council.

I believe the Animal Health Commission will ask the legislature at its next session to make an appropriation to be used for the purpose of indemnifying owners for animals condemned and destroyed. I believe they will also ask for a special appropriation to be known as an emergency fund, to be used in the suppression of serious outbreaks, such as our present outbreak of dourine, or other serious and extensive outbreaks that might occur.

Whilst the act creating the Animal Health Commission and substituting a new Veterinary Examining Board for the old board, making the State
Veterinarian secretary of the new examining board, has practically doubled
the work in the State Veterinarian's office without additional help or remun-
eration, yet I feel free to say that with all the added work, there comes
a relief from the assistance, council, and backing, of the Animal Health
Commission, which practically remunerates for the extra labor. One of the
strong features of the act is the fact that no big salaries are provided for.
The commission is given a maximum amount of power with a minimum
amount of salary.

I herewith quote Sections two, three and five of Chapter 115, which
particularly outlines the powers, duties and compensation of the members
of the Animal Health Commission. During this meeting the province of all
state veterinarians present should be to get together and adopt a uniform
health certificate to be used in all interstate shipments of live stock. As
the condition now exists the railroad company in contracting to carry stock
and in requesting that the proper health certificate accompany the stock,
cannot instruct their agents as to what kind of a certificate is proper or
regular. They cannot tell him to look for one five inches or two feet in
length; they cannot suggest any regulation color of the paper, on which the
certificate is made out; they cannot instruct them to look for a test,
record with any given number of temperatures taken on the animals, in fact
it is a Simon pure guess what the next health certificate will look like when
issued. The last form adopted by the Bureau of Animal Industry, I con-
sider very practical. The one now in use in our department, I also consider
as practical as any I have yet seen, in that it carries on the fact of it spaces
for the description of the animals, and on the back of the same paper,
columns in which to record the tuberculin and mallein tests. We are using
only the one color. The bureau adopts one color for certificates on cattle
and another color for certificates on horses which may be preferable. I
make this as a special suggestion to this association, that they get together
and adopt a uniform blank, and as rapidly as possible bring about the enac-
tion of uniform laws and rules governing the transportation of all live
stock.

The President: Gentlemen, we have listened to two very valu-
able papers on a very important subject, and I find that Dr. Luckey
is down for "Discussion of Relative Merit of These Plans."

Dr. Luckey: Mr. President and gentlemen: After listening
to these papers, both of which were very comprehensive and concise,
I feel really disappointed that I am not able to start a scrap of
some kind here this morning; but I must concur in the outline of
general principles as expressed by Drs. Crewe and Gibson, and if
the subject had not been so well covered I would take a little time
to emphasize a few points. I think you will agree with me, however.
that to prolong this discussion in view of what we have before us,
would be unnecessary.

If it were not for many little things that crop out that lead to
larger results I would be in favor of a state veterinarian, issuing all
orders, and have those orders go. Let him manage the thing and be
held responsible. Of course, then comes the trouble of keeping out of politics. We have a board of nineteen, and as a rule a large board impedes progress in the line of sanitary work.

My friend, Dr. Gibson of Iowa, brings in the question of uniform health certificates. We all agree that we ought to adopt as quickly as possible a uniform health certificate, and we ought to get one that will be permanently satisfactory.

I cannot emphasize too strongly the necessity not only of the state veterinarian, but the deputies having proper qualifications and having some regular deputies to do steady work is the best, according to my idea and practice.

A pamphlet giving a condensed statement of the requirements of interstate inspection is a good thing, and I have often thought that the sanitary authorities of every state ought to adopt the system.

Dr. Cary: Mr. President, there are a few points I would like to discuss more or less, or to ask a few questions concerning. In the constitution of the boards, the appointing power of the governor, and so forth, it strikes me that we have a rather great variety of forms and methods. We all agree that it is an essential feature to eliminate politics. In my experience and observation in the different states, with the appointing power of this Board given to the Governor, notwithstanding the fact that he cannot remove more than one or two members a year, it still leaves it in politics. I am not here to state just what method should be adopted. That may be different for different states, and I do not see with the varying constitutions and laws of the different states, that we can always get a uniform law that will apply in each state. There will always be more or less difference, but I think there are very much better methods of getting this Board into power than having it within the appointing power of the Governor. As long as you have a good Governor, that is all right; as long as you have only one member of the Board removed a year, or one appointed every year, the entire Board cannot be changed in one year, that is true, but nevertheless the color of the Board, the object of the Board, the real advantages and methods of the Board can be so materially changed by such appointive powers that you can often kill a law by not having the proper men to enforce it.

I am not here to tell you how to get around this, but I believe there are methods of getting around it: I believe we ought to consider those points. I for one have been through a number of years
of experience in connection with this work, and I firmly believe in
the elimination of politics from any such board entirely. I think
it is the duty of this Association to look after that point as well as
to look after some others.

There is one other point I want to discuss. I think the different
states have not carried their rules and regulations, or rather the
legal standing of them, up to the Supreme Court sufficiently. We
have some decisions and I note in the decisions rendered that the
Board has administrative power and the right through the admin-
istrative power given them to make rules and regulations that are
legal and will hold before the law. I find, however, that there are
but two or three states that have had decisions on that point, and
these decisions are all based on the reasonableness of the law. We
want more decisions on this very point, because we have more fights
on the point of whether the Board has the power to make regulations
than anything else.

There is another feature I want to discuss for a moment. I
find more trouble with veterinarians as a rule who
are unqualified
to administer the law legally and tactfully than almost any other
source. I think that point needs discussion here, because that is
one of the points that comes right home to all of us. I think we
ought to have in the colleges courses of lectures on the administra-
tion of live stock sanitary law. We need them. We are giving
right here day after day while we are in session instructions in the
application of sanitary law. We need them and we need them
badly in the veterinary profession, and I say we ought to stimulate
some of the colleges to do more work along that line, so that when
the men come out they are not totally deficient in the administration
of live stock sanitary law.

Dr. Reynolds: Mr. Chairman, Dr. Cary put his finger upon the
one spot in our Minnesota law which I for one would like to see
changed. It is the only important point that I would care to change, and that is the fact that our board of five members are
appointed by the Governor. We have this advantage, that they serve
for a term of five years each, and only one man appointed a year.
The trouble that we have been anticipating as possible in Minnesota
has never come and it might never come, but it would be possible
for us to have our work disturbed on account of that one difficulty.
Dr. Cary insists that there must be some remedy for it. Some of
us that have been studying this pretty hard for quite a while, the
only remedy that I have been able to see and that I have stood for is
that a majority of our board of five members, at least a majority of
three members, should be ex-officio members, they should be representative of organizations or institutions that are related to this work. I might say that is what we asked for when our law was being prepared years ago. I want to express my pleasure at the great steps that my own State of Iowa has taken. I have been proud of Iowa for many years for nearly everything except her state live stock sanitary work. She has had to take the very best she could get, and then plan for the future when conditions could be improved. No one has been able to get just what they wanted at first, and I take it for granted that they never will, but there are a few points that I am quite sure that Iowa will come to in the course of time. First, the state veterinarian should not be a political appointee of a political board. He should be an employe of a non-partisan board, not appointed by the Governor, but employed by the Board for the following reason: The Board may employ a good man and keep him in service just as long as he gives good service regardless of his politics or regardless of political conditions in the state, and the Board may get rid of an inefficient employe just as soon as they please, no matter how much political backing he may have; and, secondly, the reason why that plan is not best is that the Governor may at any time appoint a man as state veterinarian who is not in sympathy or in harmony with the board of which he is to be the secretary and executive officer, and then immediately there is a factor of difference of opinion, and good work and good results are impossible.

The other point that I think needs improvement is the short term of the board members. Five years is short enough. We have found in our experience that it takes about two years to make a veterinarian or a layman a real good representative member, particularly laymen; but if a man is to serve only two years it takes him at least one year before he is of any particular account on the board, and then he can render only one year of efficient service. A board membership should not be less than five years, and I was very much pleased to hear Dr. Gibson's stand for the general proposition of employing a body of men on full time, rather than the plan of local deputies, employed temporarily for temporary service, which I think is an ineffective, inefficient plan that we must decry.

The President: Gentlemen, we have on the program "Discussion, Co-operation Between Federal and State Authorities in Control Work," and I will ask Dr. Bahnsen to deliver his address.

Dr. Bahnsen: Mr. President, it was suggested to me this morning that I was supposed to prepare a paper on this subject, but
I could hardly understand that, because the President asked me for a discussion and I did not know how I could conduct a discussion by a paper, so what few remarks I have to make I am going to make from notes which I have taken this morning of the points that were brought out, and a few points which had been already before me.

First and foremost, the word co-operation means a singleness or common interest. There must be a common interest where you expect co-operation. In the second place, in order to make that effective you must have uniform requirements and uniform laws. Those are basic principles, and we cannot get away from them. The minute you overlook them you cannot have co-operation.

In addition to the factors that enter into co-operation between federal and state authorities, I want to bring in two other factors that to my mind—one of which at least is far more important than state and federal authority, and that is the public. The public has an interest in this matter, and also the transportation companies, so as I look at it, there are really four factors in this discussion. State authorities, federal authorities, transportation companies and the public, and let us just review each one of those separately.

First, state organization. I think that point has been very well covered, although I do not agree with all the points brought out by Dr. Reynolds and Dr. Cary. I disagree with them on this. They say we want to eliminate politics. You cannot do it. Anything that is worth sticking a finger into, the politician will have a finger ready; you cannot keep him out of it. If it is not worth going after the politician will not bother with it; that is not his game, but if it is worth going after he will get into it. If we cannot keep him out, let us get behind him and lift up with him. Let us take the politician himself before the public and thereby get his co-operation, for I am sure when it comes to perfecting a state organization and getting what you want, you cannot get along without the politician. That is true in the southern states—I know whereof I speak, and I am satisfied that the conditions in the northern states are not very much different. If you expect to get anything you have got to see the politician. You have got to back him up and push him just the way you want him to go. We must have the co-operation of the politician. The minute you can make him see it is to his interest, that is all that is necessary to interest him in a thing. You have got to educate them along that line; and right there is where the state ought to begin, and that is why I put the state ahead of the federal authorities, because they have the public to deal with.
I am going to take up just two points, tick eradication and tuberculosis, in order to illustrate my point. It is very easy to enact rules or regulations and have the public accept them, provided it does not run contrary to their interests as they understand it; but if their interest is not vouchsafed and looked after they will be against it, I don't care what it is. For instance, in the southern states we find that the public is not very strongly in favor of tick eradication. They have had the tick with them so long they have learned to ignore the tick, and if you have a state veterinarian or a state sanitary board, or some organization of that kind which is engaged in tick eradication, until you convince them that it is to their interest, they will oppose it, there is no way to get around it, so we have got to teach the public and show them it is to their interest to adopt a remedy or a regulation that we enact. That is true in the southern states, but what about it up here in the north? Look at Illinois. I cannot think to save my life of as ridiculous a position as Illinois has placed herself in on the proposition of tuberculosis by ignoring the tuberculin test.

The trouble with Illinois in that case is that the people, or rather the stock raisers of Illinois thought they had an interest at stake, and they got the political machinery to work and killed the test. That is all there is to it. There is no use to mince words. As I have already told you, you cannot get along without the politicians, you have got to have them with you, and in order to have the politicians with you, you must have the public with you, because the politician has constantly got his ear right to the ground, and if he hears the mumble and the murmur of the people he rises up and stands for something as soon as he knows where the public stands, and we have got to line up with him. It is merely a question of educating the public, and if the public is educated to see where their interests are located, you won't have much trouble along the line of enforcing sanitary rules and regulations.

As far as state and federal co-operation is concerned, I can only speak a pleasant word, for the simple reason that we have had the very best of co-operation in our section. It gives me great pleasure to endorse the co-operation which we have had from the federal government, and yet I am sure that in some instances they make mistakes. You may think that this is a rather radical statement, but it takes a genius to make good in the field and tick eradication work, and I do not do any field work, either. (Laughter.) But, gentlemen, you have got to meet the public under conditions when they do not endorse your work, when they oppose it strongly it simply takes a genius to look after the people. Tick eradication—
that is the whole thing at the present time in the south; tuberculosis will come a little later.

The transportation companies deserve a great deal of credit for conducting the business as well as they do, and co-operating with us as well as they do under the conditions. It is an absolute certainty that you cannot expect a railroad company to make a success in their co-operation with us when they depend in many instances on a forty-dollar agent to do the work. A good many of them would not know a health certificate after they read it, and yet you do not offer them one health certificate, but each man wants his own kind and they hardly know where they are at. Under those conditions you cannot hope for real co-operation of the transportation companies.

This last year we enacted a special rule requiring an official affidavit for the movement of cattle. As soon as we got out the regular rule we sent it to the transportation companies, giving them a sufficient length of time and notifying them again, and you have to have patience with the transportation companies, just like you do with the individual. It is hardly fair to expect that every piece of their machinery and organization should be working in tip-top order; they cannot do it, so we have notified them again and again at regular intervals, and finally I want to say that we have splendid co-operation from the transportation companies, and I believe that if we adopt, as has already been mentioned today, a uniform certificate that will be the greatest move as far as co-operation from the transportation companies is concerned that we can possibly make at this meeting.

In my opinion the federal authorities ought to have absolute control of all interstate shipments, and I believe that the inspection of interstate movements of live stock ought to be done exclusively by veterinarians in the employ of the federal bureau. I do not want to leave the impression that the local veterinarians are not qualified to do it. They are qualified, but it is an entirely different transaction with them. The average practice of a veterinarian is not as a sanitarian. He has his own business to look after and he figures his time on a dollar and cent basis, and there is no money in making tuberculin or mallein tests. On the contrary, the federal authorities could well afford at certain principal shipping points in the south and the larger shipping points in the north to support veterinarians to make tuberculin and mallein tests. I believe that will give us far better results than what we rely on at the present time. You take it today in Kansas City, Chicago or elsewhere and they are
getting $2.50 for an inspection, and you cannot expect much of an inspection for $2.50. Gentlemen, it is a farce in some respects, and in order to put it on a real sensible basis, you ought to put it in the hands of people that do not look for dollars and cents.

Now with reference to tick eradication and tuberculosis, you have got to make the public your friends, you have got to show them that you are really looking after their interests, but the great trouble with sanitarians in the field has been a lack of interest on their part and failure to get on friendly terms with the farmer. I found it necessary after taking up the work as state veterinarian to equip myself to a greater or less extent with agricultural information. When I first went before the public and talked to them about tick eradication and tuberculosis they were not interested, but as soon as I learned to talk to them about cotton, about fertilizer, about crop rotation and so on, then I could talk to them about their live stock interests and they took notice of what I said. Prior to that I could not interest them, but I found that by talking about these little things and letting them know that I understood them, I have had very little trouble in bringing them to the point where I could present these other subjects, and when the subjects are brought before them in that way they will take an interest in them. I thank you.

The President: Gentlemen, we have a short time to continue this discussion before we adjourn.

Dr. Gibson: Dr. Reynolds advocates a board made up of ex-officio members. I have had some experience on those boards, and as a rule the ex-officio member is a dead one, and you have to go out and hunt him up when you want to elect a secretary or need his vote. I do not think you get satisfactory work if you put too many duties on one person.

I agree with the Doctor on one thing—that the time will come when all sanitary work, whether connected with the interstate shipments of stock or not, will be done without expense to the owner, and I believe it should be. I feel that it would be putting a great burden upon the federal authorities to ask them to do all the work, because they certainly could not undertake to do it without a very large increase in their force.

In our importation rule there was one concession made. The shipper, or more particularly the poor immigrant, was subjected to great hardships. He was held up here and held up there, sometimes for two or three days. We now allow them to reach their destina-
tion and require the railroad company to notify us that such a shipment is in transit without having the proper certificate, and then we go out after them. Of course, under our rules we do this work at the expense of the owner.

Speaking about the average veterinarian being bad or incompetent, I received a very elaborate affidavit on a load of steers recently from a veterinarian to the effect that "these steers were not intended for breeding or dairy purposes." I wrote him and asked if he believed it was necessary to make an affidavit to that effect, and he came back and argued in favor of it. This is quite an intricate question.

The meeting adjourned until 2 o'clock P. M.

Two P. M. meeting called to order by President DeVine.

METHODS OF POPULAR EDUCATION IN AN ANTI-TUBERCULOSIS CAMPAIGN.

By A. J. Glover, Editor Hoard's Dairyman.

It would be difficult indeed to find a farmer, dairymen or breeder who does not possess some information concerning bovine tuberculosis. So much has been written on this subject in agricultural and dairy papers, bulletins from the United States Department of Agriculture and the State Experiment Stations, pamphlets from the City Health Departments and State Sanitary Boards, and information received through lectures delivered at Farmers' Institutes, Dairymen's Conventions and Agricultural Colleges and Schools, public demonstrations at fairs and elsewhere, that the great majority of the rural population has some sort of an opinion regarding tuberculosis. The laws which have been passed governing the sale and shipment of cattle from one state to another have created much discussion among cattle dealers, breeders and others about tuberculosis. These agencies must continue their work in behalf of healthy herds and circulate information that will give all people a clearer and firmer understanding of tuberculosis. I know of no other way of disseminating knowledge on eradicating tuberculosis than by these means. With the present information the average dairymen or stock raiser has concerning tuberculosis, it is difficult for him to become enthusiastic over the tuberculin test and the slaughtering of all reacting animals when they look healthy and well. He is not entirely to blame for his attitude. The men engaged in advocating the use of the tuberculin test and methods to eradicate tuberculosis have neglected too often to mention the limitation of the tuberculin test. They have said in short: "Tuberculin-test your herd, dispose of the reactors, and the work is done." Now, we know better, for a herd in which fifty per cent of the animals react, the safe and about the only way to treat it successfully is to consider all the animals diseased. Briefly, there is a great deal more to this subject than tuberculin-testing and disposing
of reactors, and farmers know it in their vague and imperfect way. There is but one way of meeting a question and that is to state frankly and squarely everything concerning it, whether it be for or against it. True progress and education can come in no other way.

Several reasons might be given why many sensible stock raisers are opposed to the tuberculin test and the attempt to eradicate tuberculosis from the herd by slaughtering: The tuberculin test has been applied by incompetent and unscrupulous men; drastic and unreasonable ordinances passed by municipalities; men of influence stating that the tuberculin test should never be used until animals show by their physical condition that they have tuberculosis; politicians, to advance themselves in public favor, making use of the mistakes made in the attempt to eradicate this disease; the statements of scientists, based upon too few facts, about the danger of using milk and its products from tuberculous animals. All these agencies have hindered progress and given opportunity for much idle talk. These things, however, are but a part of the popular education in the anti-tuberculosis campaign.

The stock owner, through his selfish interests and a lack of information concerning the nature of tuberculosis, holds himself aloft from the authorities, for he believes that if he follows their instructions that he must sustain a heavy financial loss. If the cattle owners of this country understood the nature of tuberculosis and the economic importance of getting rid of it, the question would be easily solved, but even then it would take years to free the herds of this country from tuberculosis.

The eradication of bovine tuberculosis in this country is a much bigger job and more serious than is realized by men who are not in touch with the stock interests. The limitations of the tuberculin test and the lack of competent help to apply it are in themselves obstacles of no mean proportions. Men of influence, none too sincere in their actions, and ignorant of the nature and causes of tuberculosis, are lending their influence in behalf of the popular side of this question.

Recently a Committee of the Illinois Legislature brought in a report, after some feeble investigations, in substance as follows: "First, tuberculosis does not injure cattle and there are fewer cases today than there used to be. Second, tuberculin will not detect it. Third, a physical examination will determine whether an animal is tuberculous or not. Fourth, tuberculin will cause tuberculosis. Fifth, mistakes occur in making the tuberculin test and it is also applied by dishonest men. It is only the veterinarians and officials who want jobs that are advocating the use of the tuberculin test for determining tubercular animals. Tuberculosis does no harm to the animal. Here is a body of men, engaged in making laws for the State of Illinois, who have shown themselves to be either very ignorant regarding the subject of tuberculosis (the only charitable view of their actions), or are thoroughly dishonest. There is no more important work than to gain the confidence of the farmers to show them that their self-appointed defenders are their worst enemies. Without the co-operation of stockmen we are as helpless as a babe in its mother's arms in dealing with this subject, and before there can be co-operation there must be confidence. We have not only an anti-tuberculosis campaign before us, but also a campaign against the demagogues who are looking for reward, plunder and reputation. Unfortunately for the cause, they are found on both sides of the question. The truth of the whole situation must be placed squarely before the stock raisers, and there will be found
In every community some man who will see the subject in its true light and become an educator, either by silent example or word, or both, in this stupendous, double campaign that confronts us.

It has been said by Dr. Favill that "Tuberculosis in dairy cattle is not a 'baby question.' It is a cow question. Until that is recognized by the many as fully as by the few the subject will remain in its present confusion and odium."

It is encouraging, however, to find that each year scientists are unfolding some new truths concerning the tuberculin test and ways of handling and treating tuberculous herds, and more and more are the progressive farmers realizing their part in this great work. While the scientists must continue their laboratory and practical work in the study of tuberculosis, yet there must be more systematic work done to educate the men, who, after all is said and done, are the greatest factors in the campaign to eradicate tuberculosis from the cattle in this country.

The question of procedure in this educational work is one that concerns every man interested in bovine tuberculosis. I wish to give you an extract from a letter, which came to Hoard's Dairyman from one of its subscribers. It is, I believe, from a sincere but misinformed man. The letter gives us a hint regarding the kind of educational work that must be done. It reads in part as follows:

"While I appreciate your paper very much, yet I don't agree with all of your contentions; one of them, for instance, is the tuberculin test. Now, I know what you and all other advocates of that test say of those who disagree with them, namely, that they are ignorant; but that is no argument and never will convince us ignorant farmers that we are wrong, neither will it convince us for you to assume that you know it all; but when the advocates of the tuberculin test can go into a herd of cows to all appearances healthy, and should any of them react, then slaughter the reactors and show us that seventy-five per cent of them are affected; then we will sit up and take notice; but while we see reacting animals time and again which fail to show infection on post-mortem examination we will not take much stock in the tuberculin test."

When such men are reached they will become workers in behalf of the tuberculin test and the eradication of tuberculosis.

I do not know of a better way to educate the stockmen of this country to the ravages of tuberculosis than through public demonstrations, although I recognize that this is an expensive and a slow way of dealing with this subject. In Wisconsin many public tuberculosis demonstrations have been made. Our officials have gone into communities and tested herds and then slaughtered some of the reacting animals before a large crowd of farmers. when they see with their own eyes the condition of animals that have tuberculosis they will be convinced that scientists have some right to make the statements that they do and will have a sympathy for the work. These tests have been carried on by our Experiment Stations, Live Stock Sanitary Boards at our state fair, county fairs and other public meetings.

In a bulletin published by the New York Experiment Station can be found some work done by the city officials of Geneva, N. Y., in behalf of improving the city milk supply, which suggests what might be done to interest
A casual investigation found that the milk supply of the City of Geneva was not as good as could be desired. The health department took it upon themselves to improve it. They appointed a milk committee, who secured the services of a man for the purpose of inspecting the dairies supplying milk to Geneva. A score card was worked out, also a system for grading the dairies, which were classed as poor, medium, good and excellent. Upon first inspection it was found that not a single dairy could be classed as good; they fell into the two classes of poor and medium. Without entering into details as to the methods of inspection and the reports made of the different dairies, I will state that at the first inspection of this year every dairy supplying milk to Geneva was classified as good or excellent. The health department announced publicly through its quarterly report the conditions of every dairy supplying milk to Geneva. This lead the retailers to become very much interested in obtaining a good report and would not make contracts with dairyman who did not produce a good grade of milk, for the producers names, as well as the retailers were announced to the public. In other words, the method pursued by the Board of Health of Geneva touched the pocketbooks and pride of both the retailers and producers and through the close co-operation between the health department, the retailers and the milk producers, the city milk supply was improved very rapidly. The health department did not use its legal powers to any extent, but proceeded to accomplish the results through education and co-operation.

The bulletin states: "In May, 1908, a tuberculosis exhibit under the joint auspices of the New York Dairy Department of Health and the State Charities' Aid Association was held in Geneva. One day was devoted to bovine tuberculosis. Partly as a result of this exhibit, milk from two dairies of tuberculin-tested cows was offered to the public. In one case a large dairy company offered the product of a tuberculin-tested herd at ten cents a quart. This offer met only a limited response. In another case a small dealer offered milk from tuberculin-tested cows at six cents per quart. His custom immediately rose to the limit of his supply. Now for the first time in the history of the city it was possible to obtain commercially a milk which a careful parent could consider safe as a food for children."

As a result of this action, or this public exhibition, more dairymen wanted to free their herds from tuberculosis; they wanted favorable reports. From the work that followed the milk producers themselves asked for an ordinance prohibiting the sale of any milk unless it came from tuberculin-tested herds.

The bulletin further states: "Payment for milk on a sliding scale, based on the official dairy score and the presentation to all parties of the facts regarding the sanitary conditions under which the milk was produced and handled, quickly improved the quality of the municipal milk supply. The dairymen were quick to produce a high grade of milk for which they could obtain an adequate return. Here, to me, lies the nub of the whole situation. When dairymen are asked to clean up their barns and construct them in the manner in which they can be kept clean and wholesome and properly ventilated and lighted; when they must go to the expense of keeping their animals free from all kinds of diseases and give them the extra care necessary to produce good milk, the consumer must be willing to pay an increased price
for this product. So far as I know, all the agitation that has ever been made in favor of a better milk supply, very little has been said to the farmer about increasing the price of his milk. There needs to be an intelligent co-operation on both sides. The state, with her different organizations, must help the farmer to see the importance of getting rid of tuberculosis and he must be shown the right methods to pursue and made to realize there is a financial gain for him, as well as a satisfaction of knowing that he is producing a healthful product.

Besides an intelligent and hearty co-operation of the educators and farmers and the teaching of the necessary sanitary methods to follow in order to combat tuberculosis, the stockman must be taught that the disease originates from a germ. It is not the filthy, poorly lighted and ventilated barns that cause tuberculosis, but these conditions help in spreading the disease when the germ is present. It is important that the stockman be taught how the disease is disseminated by the introduction of diseased animals; that milk produced by tuberculous animals, when fed to calves, is very likely to give them this disease; that stables, cars and places of exhibition are likely to infect cattle unless proper methods are taken to disinfect these places. We should not neglect to inform the owner of stock that in herds where a large majority of animals react to the test all of them should be considered diseased, for the healthy ones that have been exposed are apt to respond to the tuberculin test in a short time. I am of the opinion that too often men have been informed that by one test tuberculosis may be eliminated entirely from the herd, but experience has taught that this is not true. This false teaching has been the means of turning some against the tuberculin test and has led to more or less confusion in reference to its application and value. Such circumstances plainly show the importance of well trained men, men with discerning and judicial minds, for leaders in the anti-tuberculosis campaign.

It has been stated by the Bureau of Animal Industry that the losses from bovine tuberculosis amount to approximately twenty-four million dollars annually. If some method could be devised to mark the animals coming from the different farms, especially from districts known to have tuberculosis, and the losses of animals unfit for human food sustained, wholly or in part, by the sellers it would be touching them in a very tender spot. I know of no better way of putting this subject squarely before these men than by some arrangement that will make them bear at least a portion of the losses caused by tuberculosis. I can readily see the stupendousness of such an undertaking, and how difficult it would be to locate the farm from which the tubercular animals were purchased. Some method of this character must be perfected if we are to reach everyone who should be concerned in this anti-tuberculosis campaign.

I believe most thoroughly in agricultural colleges and schools and the teaching of agriculture in all rural schools. When the time comes that we can have our rural schools consolidated and a good course of agriculture taught, it is going to aid mightily in solving many of our complex problems. In Wisconsin we have something like twelve cow-testing associations. It has been our experience that wherever a county agricultural school is located it is comparatively easy to organize and to keep up a cow-testing association. The work is looked after by the principal of the school or some one connected
with it. These schools offer short courses to the farmers of the county and the institution becomes an educational and social center.

It is not necessary for me to dwell upon what a school of this character might do in reference to educating farmers about the ravages of tuberculosis or to state the influence that a competent teacher would have upon the farmers' sons and daughters who attend an agricultural school and their reflex influence upon their parents. The solution of almost all of our agricultural problems lies in the hands of the younger generation. We can expect to do but little with men who have established convictions and fixed habits. In other words, a successful anti-tuberculosis campaign must be carried to the farm, and I do not know a better or a more effective way of reaching it than through our educational institutions, especially the local agricultural school.

Briefly summing up this subject, "Methods of Popular Education in an Anti-Tuberculosis Campaign," I will say that:

First. Public demonstrations where animals that have reacted to the tuberculin test are slaughtered. This gives a splendid opportunity to discuss the limitations and uses of the tuberculin test and the causes and nature of tuberculosis.

Second. The agricultural and dairy papers will always be powerful factors in disseminating information. These papers reach the most progressive stockmen in the country.

Third. Bulletins and pamphlets from experiment stations, sanitary live stock boards, Bureau of Animal Industry and other organizations.

Fourth. Agricultural colleges and school are mediums through which young men, especially may receive instructions regarding bovine tuberculosis. An organization composed of graduates and men who have attended these schools would be of untold value in furthering this work.

Fifth. There should be co-operation between the stockmen and live stock sanitary boards, health departments and similar organizations, if we expect to do the most effective work in perfecting methods of popular education in an anti-tuberculosis campaign.

Sixth. The dissemination of the truth is necessary, for "He is the freeman whom the truth makes free."

The President: The next paper is one by Dr. Robert W. Ellis of New York City.

METHODS OF POPULAR EDUCATION IN AN ANTI-TUBERCULOSIS CAMPAIGN.

By Robert W. Ellis, Editor American Veterinary Review, New York, N. Y.

Mr. President and Members of the United States Live Stock Sanitary Association: I feel that I must apologize for what must appear like presumption on my part. For surely it is presumptive for one who has been a city practitioner of veterinary medicine for nearly a quarter of a century, to present a paper before a sanitary association on so important a subject as the imposing title of my paper suggests.
So far the grievance is on the organization, but there is another side to it. Not only would the Association have been benefited by allowing me to absorb a little of its atmosphere before asking me to read a paper, but I might have stood a better chance of becoming a member had my application for membership been acted upon first. Now, while I have found it necessary to apologize for myself, such is not the case in regard to the state of which I am a representative; the best farming state in the Union, with the best market for its products in the world. As a careful perusal of the latest statistics of the United States Department of Agriculture will show. But it is the dairy interests, and excellent prices for the dairy products, resulting from the demand upon them by the 6,000,000 consumers in the neighborhood of New York City, that is of special interest to us in connection with the subject of this paper.

How are the guardians of public health to best serve the producer and the consumer? The great fundamental principle undoubtedly is the formation of both producers and consumers (by a process of education), into one great class of guardians of public health. But the specific question that confronts us, is, how shall we proceed, what methods of popular education shall we employ in an anti-tuberculosis campaign? That is the question that your secretary has asked me to discuss and which I have had the temerity to attempt.

Now I realize gentlemen, that this is a national issue, and is being presented before a national organization; but having always been a practitioner, I have been anchored for a quarter of a century in one place, the City of New York; and will ask you, therefore, to pardon me, if in drawing a picture of one phase of popular education, I refer to conditions in my own state, as that is the only place in which I have had any opportunity of observing them, and there a very limited opportunity. (But your president has had unlimited opportunities to study these conditions in the same state, so that any misstatements will be corrected by him in the discussion.) The statistics of 1910 showed us to have in the Empire State, 1,771,000 milk cows, and 889,000 of other cattle, and there is no doubt but what the figures are practically the same at present. Now then, we confront conditions for example, something like this. A farmer has a small herd of thirty or forty head, filling the milk pail to overflowing under the stimulus of the fertile pasture land such as the state abounds in, and the 6,000,000 consumers referred to, furnish a ready market for all the milk that his farm will produce and more if he had it. Now in the midst of this prosperous condition of affairs, he discovers, on taking a little time to look over his herd, that one of his cows, or possibly two of them, do not look quite as thrifty as the balance of the herd, and reluctantly, fearing the outcome, he calls in a veterinarian, who is able, we will say to make a physical diagnosis in this cow or these two cows. That means advanced tuberculosis in one or two cows whose milk is being mixed with that of the balance of the herd and shipped down to supply a part of the 6,000,000 consumers. The veterinarian induces the dairyman to have these two cows killed at once, and he opens them up and shows his client tubercular lesions of the lung, pleura, milk glands, etc., in an advanced stage. This is the first post-mortem he had ever witnessed and it disturbs him mightily (Popular education in its most convincing form). He becomes thoughtful and wants to know something about the balance of the herd in which the veterinarian has failed
to find physical evidence of tuberculosis; but who have been associating with these advanced, "open" causes; browsing over the same pastures day after day, drinking from the same stream or pools, (often perhaps at the same moment) for several months; are they all right, or what does the veterinarian suggest? The veterinarian suggests the tuberculin test and the dairyman, if he has been taught its value and is honest to himself and his customers, and really desires to find out where he stands, consents, but if he has not been taught the value of the test and therefore does not believe in it because he has read from some unreliable source that it is worthless, he hesitates or refuses altogether. And can you blame him when you stop to consider his position, the product flowing into the pails, and the market eager for it? Here then is an opportunity for popular education in an anti-tuberculosis campaign. And if the veterinarian is properly equipped to give it, much can be accomplished. What are the requirements? In addition to being thoroughly qualified in his profession, he must be honest, thorough, patient and painstaking. With these qualifications he will be in a position to explain to his client the nature of the disease, its ready transmissibility from one animal to another in the herd, and the possibility of its transmission from animal to man through animal food products under certain conditions; neither exaggerating nor under estimating, for we should always recognize the fact, that, while boldness of statement invariably attracts attention, analysis is the final resort of the thinker before becoming convinced; and the man engaged in agricultural pursuits, is usually a thinker; he has time to think. So with those awful looking lungs seen at the post-mortem of his first two cows a day or two previous, still fresh in his memory, he asks the veterinarian to test the balance of the herd; he believes the veterinarian understands the situation and becomes thoroughly interested in the next step to be taken. From now on it is clear sailing, the dairyman and the veterinarian recognize in each other a mutual desire for the accomplishment of a common purpose; the conservation of the interests of the producer and the protection of the health of the consumer. In short, a common interest in their fellowman, which never fails to bring out the best in any human being. The dairyman learns that the veterinarian after all is not his enemy, whose one purpose in life is to kill his cows and hamper his business, but his best friend, who is helping him to rid himself of a pestilence and at the same time to conserve his interests in every way that he can and meet the conditions; and he lends him every aid and co-operation in testing the balance of the herd and becomes extremely interested in the work, as he notes how carefully the test is being made, and realizes that after all, there is a great deal more to a tuberculin test than merely jabbing a syringeful of tuberlin under a cow's skin. He notes how the veterinarian weighs carefully every reaction to the tuberculin, and many important observations are entered on the chart that the dairyman had not seen at all. After all, he concludes that it is a very delicate test and requires careful training and skill in its translation, to be of any value; as is further shown by the way in which the veterinarian divides up the animals tested into little groups for special study of each group; finally recommending that a certain few be killed, and that certain others be isolated. He then proceeds to kill those that he has set apart in one group and holds post-mortem on each, which the dairyman watches closely; and when he is again shown lesions existing in various organs; some perhaps in the udder, ready to break down, others already broken down, and the veterinarian explains to him the danger that many innocent babies would have been subjected to
by longer retaining those cows in the herd, he appreciates the fact and is glad they are out of it. The veterinarian has found in him also, a very intelligent, earnest man, who wants to know what is right to do, and wants to do what is right. They then take up together the disposition of the remainder of the reactors that have been isolated. Some of them, the veterinarian may feel it would be wise to kill and make use of for beef; care being taken to discard any parts affected; and the others segregated in some remote part of the farm, and their milk, after being pasteurized, used to raise calves for the formation of a new herd. By this time the farmer has determined to have no more tuberculosis on his farm; he is determined to have a clean herd. He has all new stock tuberculin-tested before placing them with his herd, and has the whole herd tested at intervals. He has youngsters coming up, and aside from the segregated stock, all his cattle are tuberculosis free; and he desires to know what steps are necessary to keep them so. Are his stables entirely sanitary? Can they be improved in any way? These are very important points, and the veterinarian has not done his full duty to his client until he has gone over very carefully with him the question of housing his cattle under strictly sanitary conditions. He must preach the gospel of cleanliness, pure air and sunshine, in season and out of season, explaining that these elements are the greatest enemies tuberculosis has, and that filth, foul air and darkness are most conducive to its development.

Specific methods of ventilation and sanitary construction of stables, I will not take up your time with here, as they are not included in the purpose of my paper, and besides you all know more about them than I do. This example that I have given of popular education is one that is going on all over our state, not alone by the veterinarian in the routine practice of his profession, but in the work done by our State Department of Agriculture; and I believe the money the state uses for its maintenance and in paying indemnities on tuberculosis cows, destroyed by the state through that department, is well spent if considered only in the light of popular education. I assume that similar work is being done in many states and have no apprehension but what eventually, with the co-operation of the people, the suppression of bovine tuberculosis and finally its control, will become an accomplished fact.

Probably one of the most striking accomplishments in the line of popular education that has been attempted in a local way, was that of the "Philadelphia Milk Show" held in May last, the report of which, generously illustrated, occupies 115 pages of a book, 7 by 10 inches. Their motto is "To Enlighten Not to Frighten;" and their illustrations are convincing comparisons between clean milk and dirty milk, health and disease, and they have made an impression on the people of that city that will be lasting and productive of much good in the future. Another method of popular education is the press. Properly and judiciously used, the press is a medium for good, whose influence can scarcely be estimated and whose injudicious and vicious uses are equally powerful in an inverse manner. And when I say the press, I group together under one heading the daily newspaper, government bulletins, agricultural, trade and professional journals. Naturally we look for the most good from the source that reaches the greatest number. The government bulletins, agricultural, trade and professional journals, have of necessity, class circulation, while the lay press has a mass circulation. Good
results are accomplished from the publication of facts of special educational interest to each of these classes in their own particular class journal; but when the object is to present something of especial educational interest to the masses, the medium through which it may be most effectually presented, is the daily papers; and I believe that when we have reached the point where carefully written, instructive articles on tuberculosis appear frequently in our daily papers, from the pens of physicians and veterinarians (having always as their motto, the one adopted by the Philadelphia Milk Show, "To Enlighten Not to Frighten") the dangerous misleading poisonous articles of the alarmist and agitator, who is entirely uninformed on the subject with which he deals, will be largely offset, and we will have found one of our strongest allies to "Popular Education in An Anti-Tuberculosis Campaign."

BOVINE TUBERCULOSIS, ITS PROBLEMS AND CONTROL.

By Veranus A. Moore, Ithaca, N. Y.

There is perhaps no single disease that has aroused more interest and that is of greater significance to the live stock industry of this country than bovine tuberculosis. In the evolution of the present knowledge of this affection there have been many findings of such apparent far-reaching significance that they have each in turn formed an independent basis for a somewhat definite line of procedure directed towards its elimination. The sanitarian, however, must not be content with partial findings or hope for success by applying methods that are based on too few of the many phases in the complete cycle of the disease to be controlled. If we are to appreciate the problem of bovine tuberculosis and to grasp the principles involved in its control, we must put aside our theories, until the full array of facts are before us concerning the life history of its etiology, its channels of invasion and means of elimination together with an understanding of the tissue response to its entrance. When these are fully known, it will not be difficult to ascertain how to interpose a barrier that will inhibit its further spread. But when regulations for control are based on a few facts which do not include all of the essential processes of the disease, complete success cannot be expected. It has not infrequently happened that sanitary measures have failed completely when but a part of the truth concerning the nature of the disease was known. An illustration of this is found in the numerous methods tried with negative results for the control of malaria, after its cause was discovered but before it was known that it was carried by the anopheles mosquito.

In order to circumscribe the problem centered in the nature of bovine tuberculosis and the many obstacles to its eradication it may be well to review briefly the succession of discoveries concerning it and the conclusions immediately drawn from them that have operated to bring about existing laws and regulations for its suppression.

The discovery of the tubercle bacterium by Koch in 1882 brought the subject of tuberculosis and man's responsibility concerning it for the first time clearly before the public. The masterly presentation of his findings seemed to leave no doubt of the identity of tubercle bacteria in mammals. This conclusion was adopted and leading bacteriologists of the time attested to its correctness. A new etiological factor had been revealed which
possessed peculiar biochemic and pathogenic properties that differentiated it from all other microorganisms. This discovery brought tuberculosis clearly before the world as an unnecessary destroyer of man and beast, and initiated the first step in its control, namely, efforts to prevent infection.

The next epoch-making discovery was again the handiwork of Koch, who in 1890 showed that the liquid on which tubercle bacteria had grown would produce a distinct temperature reaction when injected into tuberculous individuals. When this substance (tuberculin) was applied to cattle it was found that a much larger percentage was infected than was supposed and that many apparently healthy animals reacted and upon slaughter were found to be more or less diseased. The conclusions hastily drawn from these findings, namely, (1) that the large amount of tuberculosis in man was due to infection from cattle, (2) in order to check the disease in man it must be eliminated from cattle, and (3) that all cattle reacting to tuberculin were immediately dangerous to man and to other animals, were at once availed of in the campaign against human tuberculosis. This led to extraordinary measures to eradicate tuberculosis from cattle. Health authorities assumed that tuberculin was sure in its response and that a single application would indicate all the infected animals in the herd tested. Working under these hypotheses, the American system of control was legalized and many animals were tested and destroyed. The result was that many tuberculous herds were cleaned up completely, but in others the disease reappeared and the efficiency of tuberculin was questioned. Difficulties of this nature were beginning to appear when a third important discovery was announced.

In 1898 Theobald Smith published the results of his researches into the relation of human and bovine tubercle bacteria. He found contrary to all previous statements that there were well marked morphological, cultural and pathogenic differences between them. In 1901 Koch read his famous paper in which he gave the world to understand that there was no relation existing between human and bovine tubercle bacteria. With that announcement there began one of the most intense investigations into the nature of a disease that has ever been recorded. For ten years a large number of competent men and women have been carrying on researches covering every conceivable phase of this great problem. The findings are quite unanimous in pointing out two distinct varieties of mammalian tubercle bacteria, one in man, the other in cattle, and in showing that children are sometimes infested with the bovine variety.

In addition to the question of identity or non-identity of tubercle bacteria, extended researches have shown the existence of many acid-fast bacteria widely distributed in nature that cannot be differentiated morphologically or by their staining properties, from true tubercle bacteria. Much, and more recently Schroder, has described non acid-fast organisms that produce a disease in guinea pigs with lesions apparently not unlike those of tuberculosis. Thus each of the properties of tubercle bacteria that had long been recognized as possessing diagnostic value has been found to be insufficient in itself. This has made necessary a wider range of identifying tests, thereby greatly increasing the labor of the bacteriologist. These findings have brought clearly before us the phenomenon of the acid-fast group of bacteria and the difficulty in diagnosing tuberculosis from its etiology.

Further inquiries into the explanation for the action of tuberculin have tended to verify the theory of Eber modified by Smith. This explains the
oscillation between reaction and non-reaction in certain individual cases. According to this theory, tuberculin cannot cause a reaction where the progress of the specific lesion is arrested, or where encapsulation exists. Thus it explains many of the seeming contradictions in the use of tuberculin and defines more clearly the conditions under which it can be trusted.

A further and equally valuable line of research has pointed out the class of tuberculous cattle that are spreading the virus and those that for the time being are not dangerous to others. Thus little by little the fuller nature of tuberculosis has been revealed until we have come to recognize that instead of dealing with a single question with a direct answer we are confronted with a series of complicated questions that depend for their answers upon vital and subtle forces which cannot be changed by the will or act of man.

The problem of control, however, is not restricted to the biological aspects of the disease. The practical side presents complications that are equally intricate and trying. The inefficiency of present methods for eliminating even advanced cases is shown by the constantly increasing number of tubercle bacteria in market milk. The steady demand for milk from the growing cities has revolutionized the former methods of handling milk cows. To keep up their milk supply throughout the year, farmers buy fresh cows and sell the dry ones. By reason of this a throng of living cattle is constantly passing through our dairy districts. Many of these animals are infected, but they continue with the others until they become well advanced cases and spreaders of the virus before they are dispatched.

The American system of control which consists in tuberculin testing dairy cattle and slaughtering the reactors, was among the first to be inaugurated. It was started when the authorities believed (1) that human and bovine tubercle bacteria were identical and (2) when tuberculin was thought to give a reaction in all infected animals. It started as an official measure and carried indemnity from the state for the infected animals. Such payment was justified on the ground of public safety and equity to the owners. With slight modifications the system has continued in operation since its introduction. Could this method have been introduced soon after the infection occurred it would have been successful generally, as it has been in certain localities and in single herds, where all tuberculous cattle seem to have been eliminated. Unfortunately in point of time it came so late that there were too many infected animals for the available funds as well as too large a number of arrested cases. As a result, the official use of tuberculin is restricted to a small percentage of the cattle. In New York it is less than two per cent annually. Local boards of health and milk commissions have required testing of perhaps five to ten per cent more. But even this is not sufficient to insure any great decrease in the number of tuberculous cattle. A very large part of the remaining ninety per cent is not tested. In these tuberculosis is continuing to spread according to its own methods. There is more or less private testing, but where the laws are too stringent dairymen themselves are not active in finding the disease. The health authorities and often consumers will not permit the reacting cows to remain in the milking herd, although evidence of disease cannot be detected except with tuberculin. At the same time they accept milk from herds that have never been tested and
which often contain spreaders of the virus as shown by an examination of
the milk.

A long and careful study of tuberculin has shown that with a reaction
there is present an active tuberculous infection, but its failure to react does
not prove the absence of the disease. Experience has shown and theory
explained that when infection exists either in the period of incubation or in
a state of arrest tuberculin is not effective. These findings have answered
many of the criticisms against it which are usually made by those lacking
knowledge of when it can and when it cannot cause a reaction. These
important facts have been disregarded, and the system, while applied with
good faith, has occasionally allowed infection to remain in the herd, where
the disease has later developed, and the herd again becomes a center for
dissemination. For this tuberculin has been unjustly blamed and not in-
frequently the integrity of the men who used it has been called in question.
Unfortunately the use of tuberculin has come all too often to be considered
synonymously with the slaughter of a herd and not as an agent of great
value in diagnosis.

Again the supposition that all reacting animals are immediately dan-
gerous has been carefully investigated. Many examinations of milk, feces
and saliva of infected cattle have been made to ascertain the extent to
which open cases of tuberculosis exist without giving physical evidence of
the same. This work is now in active progress, but the results already
reported† indicate that spreaders of the virus can be detected in a very large

*Resolution 2 on tuberculin passed by the International Commission on the control of
bovine tuberculosis reads as follows:

1. That tuberculin, properly used, is an accurate and reliable diagnostic agent for the
detection of active tuberculosis.

2. That tuberculin may not produce a reaction under the following conditions:
   (a) When the disease is in a period of incubation.
   (b) When the progress of the disease is arrested.
   (c) When the disease is extensively generalized.

The last condition is relatively rare and may usually be detected by physical examination.

3. On account of the period of incubation and the fact that arrested cases may sooner
or later become active, all exposed animals should be retested at intervals of six months
to one year.

4. That the tuberculin test should not be applied to any animal having a temperature
higher than normal.

5. That any animal having given one distinct reaction to tuberculin should thereafter
be regarded as tuberculous.

6. That the subcutaneous injection of tuberculin is the only method of using tuberculin
for the detection of tuberculosis in cattle which can be recommended at the present time.

7. That tuberculin has no injurious effect on healthy cattle.

Petersen. Report of the N. Y. State Veterinary College at Cornell University, 1910, 60.
Reynolds and Beebe. Dissemination of tuberculosis by the manure of infected cattle. Bul-
l-in No. 60, Agric. Exp. Sta., Univ. of Minnesota, 1907.
Reichel and Deubler. An examination of the feces of forty cattle for tubercle bacilli
Schroeder. The unsuspected but dangerously tuberculous cow. Circular 118, U. S. Bureau of
Animal Industry, 1907.

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percentage of cases on physical examination. Such men as Ostertag and Poels trace failure to detect the "spreaders" to a lack of skill on the part of the examiner. Although our system has been right so far as ideals go, in results it does not seem to have surpassed or even to have equaled the attainments of the methods based on a broader knowledge of the dissemination of the virus.

In Europe there are in operation at least three methods for the control of cattle tuberculosis. The Bang method, named after its distinguished author, Professor B. Bang of Copenhagen, consists in eliminating all of the clinical cases; in testing the remaining cattle with tuberculin; separating the reactors from the well and keeping them for breeding purposes. In Denmark, however, the farmer is allowed to sell the milk from the reacting but clinically sound cows, and that country claims to hold the record of minimum tuberculosis in children. His method has been applied in over ten per cent of the dairies of Denmark. The distinctive advantages of Bang's method are that it recognizes the property rights of the cattle owners; educates them in the nature of the disease; enables them to build up sound herds, and further, it affords protection to the public.

The Ostertag method, generally applied in Germany, consists in frequent thorough physical examinations of the cows and the removal of all suspicious cases. Tuberculin may or may not be applied. If it is used the reactors are not necessarily separated from the others. Its theoretical basis is that the disease can be detected by a careful physical examination before it has advanced sufficiently for the virus to escape. Ostertag states in his papers and he has told me personally, that the method, if rigidly carried out, will protect the milk from infection and eventually eradicate the disease from the herd. While it accords little or no protection for the inter-herd control, it seems to be effective for intra-herd protection and eradication. Further it protects the consumers of milk in that it eliminates most if not all of the infected animals before they become spreaders.

The third European procedure is known as the Manchester method. It is followed more than any other in Great Britain. It consists in making regular examinations of the market milk for tubercle bacteria. If they are found the herds from which the milk came are carefully examined and the cow or cows eliminating them are found and excluded. This method seems to deal with the immediately dangerous animals only. However superficial as a means of eradication it may seem, Delapin and Boyce report a far safer condition relative to tubercle bacteria in the market milk of Manchester and Liverpool than is indicated by the reports of similar investigations in our large cities.

After carefully studying these various methods, discussing them pro and con with their authors and examining the herds in which they are being applied, one cannot help but feel that in the eagerness to obtain at once absolute safety by eliminating all infected animals, the radical position taken in this country has tended to make haste slowly. The methods suited to eradicate an acute destructive disease such as anthrax or one that might be introduced such as foot and mouth disease, are not applicable to a malady of such a chronic nature and so widespread and deeply rooted as tuberculosis is in the herds of this country. Again, with other cattle diseases, the infected animals are practically worthless, but with tuberculosis most of them retain for a time at least their productive value.
Aside from its sanitary aspects the control of tuberculosis has an economic significance that cannot be overlooked. It was thought in Massachusetts and New York that the people would pay for and destroy all infected cattle. The records show that the maximum appropriations that could be secured for indemnity were woefully insufficient. Further, the method antagonized the dairymen and frequently failed to bring about his co-operation, without which success is doubtful. The Bang method would be open to little or no objection in this country if dairymen could sell the milk from cows that have reacted to tuberculin but which exhibit no physical evidence of the disease. At present our dairymen object to it because they have no way by which to dispose of the milk. Yet the milk from thousands of herds that have never been tested or even examined physically is accepted without question. Why is not milk from reacting but clinically sound cows quite as safe as it is from cows that have not been tested, in a country where the disease is as prevalent as it is here? Why should all the burden be placed upon the dairymen when they attempt to actually better the conditions and to offer a safer milk? The milk from infected cows is no less dangerous because they have not been tested, and conversely the milk from reacting cows is a no greater menace after they are tested than it was before.

As the known facts relative to the nature and extent of bovine tuberculosis and the existing methods for its control are before us, it is clear that its biological problems are complicated by many perplexing administrative questions. Our task seems to be to adjust the disharmonies between existing regulations and the true nature of the disease. When the dairymen understand the facts and are given legal and moral encouragement to apply them, they will see to it that tuberculosis grows out of their herds more rapidly than it grew in. Instead of vainly looking for legislation to accomplish prompt results, let us direct our attention to the cattle owner and aid him in coming to an understanding of the true nature of his task. I deplore the sentiment so often expressed that dairymen are antagonistic to eliminating this or any other disease, for in most cases they are not. As a rule, they are willing to reject all animals that their knowledge enables them to understand are diseased. The control of tuberculosis is largely an individual matter with the owners and they should be aided as much as possible. How they shall proceed and what they should not be permitted to do in accord with our present knowledge have been clearly outlined in the report of the International Commission on the control of bovine tuberculosis (see appendix). When all the beneficial results have been obtained that the suggestions in that report make possible, new knowledge on which to base new methods will undoubtedly then exist to direct if necessary further procedure. I feel that any legislation that brings to the cattle owner hardships which are not called for by the true nature of the disease itself tends in the end to spread rather than check the infection. Knowledge and honesty are the two great potential factors in the control of bovine tuberculosis and these cannot be acquired by legislation.

**NEWER METHODS OF TUBERCULIN TESTING.**

By Dr. K. F. Meyer, Director of the Laboratory of the Pennsylvania State Live Stock Sanitary Board.

There is no doubt that the subcutaneous inoculation of tuberculin with the consecutive taking of temperatures has to be considered the classical, most up-to-date method of testing animals for tuberculosis, particularly
cattle. The value of this test need not be discussed any more. Still, from a practical point of view, some factors have a great importance, and occasionally render the test difficult, in so far as the application and the interpretation is concerned. At the present time the following points have, in my mind, to be considered for the subcutaneous test: namely, following an injection of tuberculin with a severe febrile, diagnostic reaction, a dissemination of the tubercular process may be observed. (Hess and Guillebeau, Struve [Tubercular meningitis] Klimmer and Kiesig, Garth, Kranich Irritation, own observation).

In the majority of cases the animals are sick during the febrile reaction; the milk quantity is diminished, and, by the taking of temperatures, they become more or less disturbed. The procedure of taking temperatures absorbs time and demands trained and experienced people, because in our interpretation of the test, we rely particularly on the training of these men; but how often is it possible to obtain assistance, on account of expense and cost? Another point not highly enough mentioned in the literature, and applied in veterinary practice, is the variability of our tuberculin preparations. With our present methods (inoculation of tubercular guinea pigs), we test only the smallest quantity of active substance in a tuberculin preparation, but not the actual quantity.

A cow biological method, discovered by Wolff, Eisler & Mass, (Cutaneous reaction used in dilutions) should also be introduced for the standardization of the tuberculin used for veterinary purposes.

For the last years these deductions and observations agitated the idea to study our methods of tuberculin testing, bearing in mind that the points just mentioned needed urgent remedy.

Through certain observations, that I made during my studies on the pathology of tubercular arthritis, about four years ago, shortly after the publication of Camette and Vallée, the ophthalmo-reaction and guttural reaction attracted my attention. I observed namely that cattle affected with tubercular Gonitis did not react, in 54 per cent of the cases tested, to the subcutaneous test, while positive results were obtained with the ophthalmic reaction. In 1908 the veterinary literature mentioned many successful results in diagnosing tuberculosis in cattle, by instilling tuberculin into the conjunctival sac. I extended my observation at an abattoir in Switzerland, but did not obtain uniform and conclusive results. I used at this time diluted tuberculin brute, obtained from the Institute Pasteur in Paris and Berne. The experiments were interrupted on account of my absence from a country where tuberculosis is frequent. In the meantime many publications on the ophthalmic reaction appeared; all more or less recommending the test on account of the simple application and its results.

During the last year, my connection with the State Live Stock Sanitary Board enabled me to take up the experiments with newer methods of tuberculin testing on a broader scale, because from a practical side, the following points needed scientific observation.

1. Is it possible that we may obtain in tuberculosis vaccinated animals only then a positive and marked ophthalmic or derma reaction, when the animal is actually suffering from tuberculosis? We were obliged to search for
a method of this kind, on account of the fact, first discovered by Leonard Pearson, that vaccinated animals, for two or three years, give a reaction to subcutaneous application of tuberculin, and so may be found to be entirely free from visible tuberculosis, a point which makes the tuberculin test in vaccinated herds rather unreliable. Still, our later observations prove to a certain extent that the tubercle bacilli may be present in the animal body in a latent stage, and therefore account for the positive reaction.

II. Can we detect actual tubercular animals, when they have been inoculated previously with tuberculin, by means of the ophthalmo or intradermal test? It is a well known fact that cattle, contrary to human beings, obtain a condition not to react a second time after only one inoculation of tuberculin. On account of this fact it is quite clear that the entire procedure of tubercular testing of a state to prevent the import of tubercular cattle, naturally reduces itself to a mere formality.

The preliminary inoculation of cattle with tuberculin is very frequently done by cattle dealers throughout the entire world. To check such deceiving actions in our state, is practically the aim of a series of uncompleted experiments.

III. Will the ophthalmo reaction give positive results and permit conclusive diagnosis, when the animal inoculated with tuberculin is tested in the next two days after the usual test? Can the ophthalmo or intradermal test be applied simultaneously in supporting the reaction of either? To eliminate doubtful reactions a short time after a tuberculin test, was the intention of this experiment. Everybody knows how unfortunate it often is, not to be in a position to determine, without a retest several weeks later, whether the animal is really affected with tuberculosis or not. Several of these questions have partially been answered in this country by the results of White, McCampbell and Ward, but the observations made in other countries demanded a revision of the value of the ophthalmic and intradermal test. During the last two months we started to test experimentally, to a certain extent, the three points just mentioned. Our observations from the beginning showed advantages in testing cattle with the ophthalmo test, and I therefore consider it advisable to inform you today in a preliminary note as to the method and technique applied, and the results so far obtained. From the beginning the intradermal test showed in several observations the following disadvantages:

1. The application of the tuberculin in one of the folds at the base of the tail connecting the anus is fairly difficult and demands time and skill.

2. The results can only be recorded thirty-six to forty-eight hours after puncturing the skin; occasionally a reaction is only visible on the third or fifth day after the application.

3. Only tuberculin brute Pasteur or Vakuumpersuch-tuberculin (Hochst) will give satisfactory results. (V. Pirquet & Schnurer).

4. Intradermal reaction will not occur in animals previously inoculated with tuberculin. (Confirmation of Maussu, Vallee, Ligneres).

6. Vaccinated animals will give positive or negative reactions without determining the actual presence of tuberculosis.
It has been demonstrated by Vallee that the ordinary concentrated tuberculin brute in ten per cent solution can be used. Jugeat uses dilutions of 1-10, 1-20 or 1-50, and states that the results are not influenced by the concentration of the tuberculin solution. Lignieres, Schnurer and V. Piquet recommended 1-10 diluted tuberculin brute (Institute Pasteur). Klimmer, Kiesig and Assmann obtained satisfactory results with concentrated tuberculin (Dohna), also called "Phymatin"; the investigators describe as advantage very distinct reactions.

White and Campbell did not obtain satisfactory results with the tuberculin prepared by Calmette. The publications of Foth and Wolc-Eisner explained this satisfactory. Wolff-Eisner demonstrated in connection with his work on the ophthamo tuberculin test in human beings, that the susceptibility of the conjunctival membrane of cattle to tuberculin, is comparatively less marked than it is in human beings, and that for the ophthamo tuberculin test preparations should be used, which are at least forty or fifty times more concentrated than originally recommended for human beings. These concentrated tuberculin solutions, forty to fifty per cent solutions of tuberculin (Koch), contain naturally fifty per cent glycerin and perhaps five per cent carbolic acid, chemicals, which being installed into the conjunctival sac, induce excessive lacrimation and consequently indistinct reactions. Garth Kranich and Grunert used for their work (1908) a fifty per cent solution of Bovotuberculin D. (A tuberculin which is very toxic and contains only about ten per cent glycerin, and in a twenty-five to fifty per cent solution answers the requirements of Wolff-Eisner [also Assman's "Phymatin"]). I was unable to obtain Bovotuberculin D at the time I started my experiments, and was therefore obliged to prepare the tuberculin according to the outlines given in the publications mentioned.

Wolff-Eisner stated in his last publication that the dry tuberculin (Koch & Calmette) is an excellent preparation for the ophthamo test in cattle, and used therefore this preparation. The preparation is made as follows: Ordinary conc. tuberculin (Koch) is dropped in twenty times the quantity of absolute alcohol; a fine floculent deposit results, which is collected on filter paper, washed with ether and then dried rapidly on porous plates in vacuo over sulphuric acid.

A fine granular powder, free from carbolic acid and glycerin, containing all the active substances, is obtained. Out of 100 c. c. of conc. tuberculin about ten grams of active substance are usually precipitated. A one per cent solution of dry tuberculin (Calmette) compared with the original tuberculin would be a ten per cent solution. This solution is too concentrated for tests in human beings, and accounts for the many fatal results mentioned.

Up to the present time I have used a preparation containing 20-40 gr. in 100 saline solution of dry tuberculin, corresponding with a thirty to fifty-five per cent solution of conc. tuberculin. The more concentrated a solution is used the less will tubercular animals escape the test, but it will frequently be observed that animals will give a positive reaction, although when killed they are not effected with tuberculosis. From a practical standpoint this fact is not very important, because lesions which are not macroscopically visible, have no importance.

According to the observations of both Wolff-Eisner and myself, I feel
justified in recommending this preparation as the most suitable one for comparative tests.

The application of such tuberculin is made as follows: The animal is held by an assistant by the muzzle and horn, and the head is brought into a horizontal position; one or two drops of the tuberculin solution are instilled on the conjunctival membrane of the upper eyelids; the lids are closed for ten seconds, and gentle massaging of the eyeball is applied. Too much manipulation should be avoided on account of inducing excessive lacrimation. An accurate observation of the reaction is made twenty hours after the first application of the reagent.

Our first experiment showed that the same difficulties as were met in my previous experiments had to be considered; namely, the great variability of the ophthalmo reaction in different animals, and that the interpretations of the reaction depends largely on the skill of the observers, thus causing this test to be greatly influenced by individual moments. (Physiological latitude.)

There is undoubtedly a certain training necessary to recognize the different degrees of an ophthalmo reaction; the congestion or rather the hyperemia of the membranous tis is always present, a slight oedema of the eyelids, with photophobia and lacrimosis in another stage, and marked exudative, fibrinous, purulent conjunctivitis is the most marked reaction. The exudate, grayish and tobacco-ash like, accumulates at the inner canthus of the eye and dries, forming hard crusts. The reactions were most marked between the eighteenth and twentieth hour, and gradually disappeared in the next twelve to twenty-four hours.

In twenty-five to thirty per cent of the cases tested up to the present time the reactions, after the first application of tuberculin, were not always well marked, therefore the observations which had first been made by F. Levy on human beings, namely, that the conjunctival membrane, which did not react to the first instillation, but only when the particular subject was affected with tuberculosis and had once passed a tubercular affection, was applied for our test with great success. It was demonstrated later by Vallée, Klimmer, Lignières, Foth and Wolff-Eisner in cattle, that an instillation actually sensitizes the conjunctival membrane, and that this increased hypersensitiveness never occurs in animals free from tuberculosis. The ophthalmo test is always more pronounced in tubercular animals, the more frequently the test is repeated. From my own observations I agree with Vallée and others in this statement, and I have based by observations largely on a second instillation. Another point which particularly impressed us in our experiment and corresponded with the observations of other investigators, White X McCampbell, Vallée, Klimmer, Foth, etc., is the following: On the animals available for this test I could not observe any exaggeration of the ophthalmo reaction by one subcutaneous injection of tuberculin; neither did the application of the ophthalmo tuberculin test interfere with the following subcutaneous tuberculin test. Still, this condition has to be tested against in two animals. I observed later that the inoculation of rest tuberculin slightly influenced the ophthalmo reaction. Basing this preliminary experiment on well known published facts, we decided to test out animals as follows:

All the animals were tested with five per cent solution of dry tuberculin (Koch, bovine type,) in the right eye, five days afterwards the second instillation was made with an eight per cent solution of dry tuberculin. The obser-
vations were made and recorded during the eighteenth and twentieth hour after the application for the first test, and the fourteenth to sixteenth hour for the second test. For detailed information I refer to publications elsewhere. Our test showed:

1. Vaccinated animals, not affected with tuberculosis reacted at the same time to the ophthalmic test, and gave by previous subcutaneous tuberculin test a thermic reaction. The reaction was most severe and corresponded with the degree of the thermic reactions. Several animals also reacted to the ophthalmic test in a doubtful way, but proved later to be free from tuberculosis. The ophthalmic test can therefore not be used for the testing of vaccinated animals. The anaphylaxis of vaccinated animals to tuberculin is therefore also visible in local tests.

2. About forty-two per cent of the animals which did not react to the subcutaneous test reacted to the ophthalmic test. All of these animals were found to be affected with tuberculosis.

I agree with Foth and Wolff-Eisner, that with the ophthalmic test thirty to fifty per cent of non-reactors can be detected. Two animals which for three days had been inoculated with large doses of tuberculin, gave no ophthalmic reaction, but on the post-mortem table proved to be free from tuberculosis; animals giving positive reaction at the second instillation proved on the post-mortem table to be affected with tuberculosis.

In a herd of fifty animals the simultaneous subcutaneous ophthalmic test corresponded very distinctly. (Observations of two colleagues); the autopsies have not been carried out. Animals which did not react to the usual tuberculin test did not respond to the ophthalmic test and proved on the post-mortem table to be free from tuberculosis.

The number of reports recommending the ophthalmic test has increased to such an extent that I would like to recommend that the Association consider it and test on a broad scale. The question of the tuberculosis preparations to be used has, in my opinion, been most favorably solved by Wolff-Eisner, and I consider it advisable to use the same preparations; only by these means we are able to compare the results published during the last two years.

The last word has undoubtedly not yet been spoken on this test, and it should be the duty of the different administrations engaged in controlling tuberculosis in cattle, to verify the statements in the literature, in the same way as it was done in the case of the usual tuberculin test.

**LITERATURE.**


Garth, Kranich & Grünert—Deutsche tierarztl. Wochenschr. 1908, No 14.


Moussu, G.—Semain Med. 1907, Nr. 49.


The President: The next subject on the program is “The Tuberculosis Problem,” which will be discussed by Dr. M. P. Ravenel, of Wisconsin.

Dr. Ravenel: Mr. President. I feel before beginning the few words that I am going to give you this afternoon, that an apology is necessary to this audience. When our assistant secretary wrote to me his letter distinctly stated, or at least I so understood it to be, that I would suggest a few points to lead in a discussion on this great subject of tuberculosis. You can imagine then my surprise when I found that the whole problem, human and animal, was given me to discuss, and I judge that everybody who read that program must have said at once that any man who expected to carry out that job must be an ignoramus or a fool, because nobody could tackle such a problem in the short time at our disposal. In going over this subject then my object has been to consider what points could be
best taken up at a meeting of this sort, made up as it is, and in the few hours at our disposal, and what I have to say will bear entirely on the points which seem to me to be practical, and on which we can arrive at some conclusion.

We have in various parts of the world, as has been outlined by Mr. Glover, by Dr. Moore and by Dr. Meyer—we have all over the world many of the brightest and ablest minds discussing these questions ever since the discovery of the tubercle bacillus in 1882, and many more have been discussing it continuously since the discovery of tuberculous. The International Commission, to which Dr. Moore referred, discussed this matter for over a year, studying every authority in the world which they could hear or get hold of, and they have presented their report, so it is perfectly apparent that nobody and no body of people in a short afternoon discussion can get down and cover the whole question. The problems, then, that I have collected and on which I thought we could come to some conclusion, were first, should we not bend our efforts more and more to the introduction of the Bang system, or some modification of the Bang system.

It has been pointed out, and very truly, that a large part of the opposition to the tuberculin test is due to the indiscriminate or what might be called the indiscriminate slaughter of cattle. We have the history of Massachusetts before us to teach us a lesson there. We have the fact that a farmer has a good looking herd, and a tester goes in and condemns a large percentage of them and they are slaughtered, and that we find there very slight lesions, or in many cases lesions which are not detected by the official inspector. Nobody is a greater advocate of the tuberculin test than I am myself, and I would be very sorry if any single word I say could be misconstrued as meaning that the tuberculin test is not reliable. There are cases, however, and I have proved that by my own examinations, where the most careful examinations fail to reveal any lesion which could be detected by the naked eye. In some such cases it can be seen under the microscope, but to the average farmer that is a cow that shows no lesion, and to the average inspector that will go down as a cow showing no lesion, and yet they get a good reaction, and the farmer naturally resents the slaughter of the animal, even if an indemnity is paid, an animal which to him shows no signs of tuberculosis. If we go a little bit further than that and take those cases in which a few glands are diseased, or a little bit further, in which a single gland or special organs are diseased, but in which the muscular tissue is perfectly healthy—and there are a great many such cases—is there
not in this country a tremendous destruction of life of cattle which are well fitted for breeding purposes, are fitted to the rearing of healthy calves by the Bang's method or one of its modifications? I do not think anybody this afternoon will say that there are not. I think we all must agree that there are many valuable animals slaughtered which could be put to the raising of calves and to the production of milk which with certain precautions could be sold.

I do not agree with Dr. Moore, as I understood him, that it would be a wise thing to let milk from any reacting animal be sold without pasteurization. I would never agree to that. It seems to me it would be a very dangerous step; but to return, I think we all must agree that there are very, very many animals killed with a loss more or less complete, animals which could be put on the farm and devoted to the rearing of healthy animals. I believe that this is largely because the farmers are not educated up to its value, and with the introduction of a well carried out Bang method, or one of its modifications, it seems to me that much of the opposition to tuberculin tests by the average farmer can be done away with. I would therefore suggest as one topic of discussion here, whether or not we should not as a body advocate more strongly the introduction of the Bang method or one of its modifications.

The second point is the question of the tuberculin test, is there a standard tuberculin test, or can there be a standard tuberculin test? England has one standard of test, the United States Government has another standard, several states of the Union have different standards. It is true that they don't differ very materially, and to the man who has done a great deal of tuberculin testing, or made a great study of it, the differences are not so great as to confuse matters; but to the average farmer and oftentimes to the veterinarian who has not spent much time on the subject, this variety of recommendations given by bodies which are apparently equal in authority is very confusing. Should we not have then a standard tuberculin test, with a standard rise of temperature, from what may be considered the normal temperature to the highest temperature?

The next question then is, is such a thing possible? Personally I do not think it is, but that is a question for debate. My own belief has always been that the judgment of a competent tester is more valuable than any fixed figure which we can lay down; but that is a question for debate. I see some of the gentlemen shaking their heads. I do not mean that my statement of the subject is to be taken, but I am simply suggesting the subject of whether or not
we can fix an official standard to be uniform in every state in the Union. In spite of what I have said, I recognize that an official standard must be of some use. For instance, when you take a tyro, when you put out a new man, when you go there with men who do not understand tuberculin reaction, you must have some standard to go by; but for one I would never be willing to fix that standard so hard and fast as to rule out the judgment of a competent tester, because frequently that competent tester can detect tuberculosis, even if the test does not work according to the books.

The third question which I have thought of is the manufacture of tuberculin; should the manufacture of tuberculin be invested in the state or the United States authorities, and I do not know legally whether this would be possible or not, but the principle is the thing I am after. If tuberculin may be manufactured by private firms, as it is manufactured at the present time, should there not be a strict prohibition on the use of tuberculin or the entrance of tuberculin into every and any state in the Union without official sanction and knowledge? In other words, should not all tuberculin introduced into any state be introduced through the veterinary authorities, or through some public health authorities in that state? My own opinion is that it should unquestionably be done. I may say here that this is not altogether on account of the misleading tests that may result from a second and a third test. The International Commission after considering this question a great deal, laid down the principle—when I say they laid it down they simply enunciated it, it was not original with them at all—that an animal which has once reacted through tuberculin, or once been injected with tuberculin may after that always give misleading reactions. I think that is a clear statement of it. It may always give misleading reactions, whatever precautions we take after that time, so that that is one point why I believe in the official control of tuberculin.

Just how this is to be brought about, I am not prepared to offer a plan at the present moment. There are no laws at the present time which require the introduction of the tuberculin into the subject to be made through the existing authorities. Unfortunately when the tuberculin test was first started to be used, doping of cattle, as it was called, was done largely and almost entirely by tuberculin. I believe at the present time, owing to American ingenuity, cattle are doped in other ways. Some veterinarian, I understand, invented a mixture consisting of acetanilid, salol, and a third drug, one of the anti-pyrites, which, when given to an animal shortly before a test, will effectually prevent the rise of temperature, and I
understand in England this is used to a great extent and credited to the American veterinarian profession. (Laughter.)

There are really two questions, one should be manufacture of tuberculin, and the other should be control of tuberculin. The first one, should it be manufactured by the state or by the government, some governmental authority or be manufactured by private parties? Should its introduction into the subject be controlled?

I suggest these three questions. There are many things which I might bring up, but I understand the request of the Secretary that it was to bring forward some topics for discussion which would be useful to this body, and on which we could arrive at some conclusion in the time at our control. (Applause.)

The President: Gentlemen, Dr. Ravenel's remarks I think have well opened this matter for general discussion. We will take up the matter in the order given on our program.

Dr. Luckey: Mr. President and gentlemen: I have been up against the proposition of tuberculosis and eradication work in all its phases, I think, but when it comes to locating the disease, I could only do it in one way, and that was to work in co-operation with the cities of the state, and test all of the cattle furnishing milk, or any other dairy products to the cities, and take all of the cattle as they come. We have made complete tests of all of the cattle down to single animals that furnish Hannibal, Independence and Columbus, and are now undertaking to test some five or six thousand head of cattle supplying the City of St. Joseph. We have tested about a third of the cattle supply of Springfield. The cities of the state are passing ordinances requiring official tests faster than we can do the work with the force at our command.

I have recently undertaken a little course of lectures with the high schools over the state. The first thing you have to do in Missouri is to show people. We all realize that our previous ideas concerning tuberculosis were wrong, that is, the idea that prevails among the common people, that it is a disease confined to the lungs, and in my lectures to the high school children, before I lecture I show lesions of tuberculosis affecting as many different organs of the body as I could happen to pick up, lungs, glands, liver, intestines, udder and ribs, enough to show, as we have to do in Missouri, that I was right on that proposition. I gave them my experience and illustrations of the contagious nature of tuberculosis, and what the disease will do to a herd when a tubercular animal is introduced.
therein. I illustrated as well as I could from statistics that tuberculosis was not hereditary. I illustrated from our experience that it is a disease easily controlled and prevented, and illustrated some of the lessons taught by our tuberculosis sanitarium at Mount Vernon, and one point that I think is well to make strong is, that if you want to prevent tuberculosis in a human or in an animal you want to prevent that human or that animal from eating, breathing or drinking the germs of tuberculosis. I have warned my little classes against the scientific man who splits hairs about the source or the virulence of the germ of tuberculosis, or who stops to debate and quibble over the destruction of a forty-dollar cow.

The question of the intercommunicability of tuberculosis, I think, has been settled once for all, and whether or not bovine tubercle bacillus is dangerous to the human, I am advising the children to avoid them and to try to continue to avoid eating, breathing or drinking the germs of tuberculosis from whatsoever source. I regard the man who splits hairs about the virulence of germs from different sources as an impediment to the work of the eradication of tuberculosis.

As to the public education, I have found that it is of no use to talk to a man over thirty or thirty-five years old about tuberculosis, because he has already preconceived an erroneous idea, and I have quit spending any time lecturing at farmers' institutes, and I find that the only avenue through which we can reach the public is with the people who are of the age to be in our high schools. They are not full of prejudice and preconceived ideas; they are open to conviction, their judgment is mature enough to grasp the thing that we present, and I have tried to impress upon the students of the thirteen high schools which I visited last month the feeling of responsibility that they bear. These young people can go home immediately, being properly instructed, and instruct their younger brothers and sisters, and in some cases I ventured to recommend that they attempt to instruct their parents, but to be very particular about what they said, for fear they might get threshed. In a few years many of these young children will be school teachers, and I believe that with our limited force for education, that we could well confine our instruction to scholars in the high schools, and instruct them on what I consider the five essential points, especially on the contagious, preventible and curable features of tuberculosis.

I demonstrate with colored crayons the theory of the infection and propagation of tuberculosis in the organs with incapsulated lesions, the theory of the cure of tuberculosis, by the rest treatment
and the necessity of absolute quiet in assisting nature to throw a capsule around a lesion.

In our state, in order to maintain the tuberculin test, we started out with the brief announcement beforehand that we would probably have out of one hundred cows condemned some ten head which would not show any lesion as the post-mortem inspections were made. We gave ourselves plenty of latitude, and we have been able to live up to a much closer figure, so that there is no question about the tuberculin test. If we condemn a sound cow now and then, it is overlooked by everybody. We have instructed our men in doing this work that if they condemn a sound animal now and then they will be excused, but if they leave an unsound animal in the herd, that they will not be excused.

We make our re-test of every herd every sixty days until there are no reactors, and then again at the end of the year. As I said, in Missouri we have to show them, and we are showing them, and they are beginning to recognize that it is something well worth while.

Dr. Ward: Mr. President, it seems to me that the adoption of the Bang system will meet with its own troubles in this country, owing to the fact that the majority of the American farmers do not possess sufficient patience to carry out all the requirements which are necessary if the Bang system is to do any good. So far as the other system is concerned, we all realize that it is quite a difficult matter to make a physical examination and say whether or not that animal is dangerous and should be removed from all danger of contamination to the other animals. If it were possible for us by reaction to tell whether or not an animal was slightly or badly diseased, we would undoubtedly find that there are a large number of cattle that we should not kill, but we cannot do that. Therefore it is necessary for us to look on all reactors as being dangerous to healthy animals.

So far as what constitutes a reaction is concerned, this is a matter which as Dr. Ravenel says, should be left to the judgment of the man who is making the test. You go into a herd of cattle and get absolutely no reaction, or probably one cow or one heifer makes a rise of two or three degrees, and we do not feel justified in condemning that animal, for the reason that it has that rise in temperature. If, however, this animal was shipped from a herd without any notice, then it would be a different proposition. We might think that this animal had received an injection of tuberculin two or three days or two or three weeks before shipment, or possibly it
was from an infected herd, and we would be justified in this connection in condemning an animal which gives a suspiciously high temperature. I have always maintained that in young cattle your high temperature reaches at least 105. In old cattle which are more or less affected, two or three degrees will in all probability constitute your reaction; but two or three degrees in young cattle do not in my judgment constitute reaction unless they are from diseased herds.

Regarding the tuberculin, I have always maintained that the distribution and manufacture of tuberculin should be under the control of the United States Department of Agriculture. We use a large amount of tuberculin yearly and we get the most gratifying results from the use of the tuberculin which we obtain from the Bureau of Animal Industry. When we take these commercial tuberculins, tuberculin made by experiment stations of other states, we have not had the same satisfactory results that we have received from the use of the Bureau's. Furthermore, to my knowledge cattle have been tested with the bureau tuberculin and have reacted, and have three or four weeks later or a month later or two months later been tested with commercial tuberculin. Bureau tuberculin would not be used simply because they thought—and I believe a good many veterinarians have good reason to believe that it is too active—that the injection of commercial tuberculin within three or four weeks or a month after the use of the bureau tuberculin, will not produce any result.

I am of the opinion also that the distribution of tuberculin within the state should be under the jurisdiction of the live stock authorities. We had a law passed by our legislature two years ago which requires all druggists, retail or wholesale, to report to our Board the sale of all tuberculin in order to prevent unscrupulous practitioners and the unscrupulous owners from injecting tuberculin into a diseased animal in his herd and selling it to his unsuspecting neighbor; and in that way when we receive a communication from a wholesale or a retail druggist that a person has bought some, we investigate it, we find out what use it is to be put to, what has become of the animals in the man's herd on which it was used.

So far as the location of the tuberculosis is concerned, I do not quite understand what is meant, whether it is meant we should locate the centers of infection in the subject, or as to the geographical distribution? I presume that it is as to what methods we should take to locate various diseased herds. We have done that by co-operation with the Bureau of Animal Industry. There are a number of diseased herds that have been uncovered when animals from those
herds have been shipped to slaughter points and found on inspection to be diseased. The federal inspector in charge very promptly reported to us shipments consisting of so many cows, or such and such a lot were found to contain so many tuberculous animals, either bovine or swine, and then we visit these owners and proceed to test his herd. Sometimes our visits encourage him, other times not.

As to its eradication, as stated last year, I think the first step that is necessary for all the states to take is to prevent the introduction of the disease from other states by an act of the legislature requiring animals to be tested and accompanied by a valid certificate of health. If anything is to be done with tuberculosis towards its control, it is absolutely necessary that we must get at the fountainhead. We passed a law two or three years ago which requires all pure bred cattle to be tested by the Live Stock Sanitary Board and a certificate of health issued. The result has been that we have tested the herds of something like 361 breeders in the State of Minnesota. On the first test several of the breeders had thirteen per cent of their cattle react. The second test is being made at the present time. Something like 2,000 head of cattle have already been tested, with just about one per cent reacting. After we have cleaned up the pure bred cattle, which I think we can do in the next two years, we shall turn our attention to educating the creamery organizations to the necessity of having their patrons submit their animals to the tuberculin test before their milk will be accepted at the creameries. This work has already been started. We also test free of charge to any farmer or dairyman who will sign an agreement to permit us to appraise a slaughtered animal, or providing that reactors shall be kept in quarantine under certain restrictions, and with the understanding that he will not introduce any cattle into his herd until such time as they have been properly tested by an authorized representative. In this way we have tested out from fifteen hundred to three thousand head of cattle in certain sections.

The President: It seems to me that the question of destroying a valuable animal is one of great importance. In New York State the Bang system is looked upon quite favorably, and I will ask Dr. Wills, of New York, to say a word upon the attitude of New York State.

Dr. Wills: Mr. President, the control of disease in New York State is, as Dr. Moore has intimated, dependent to a large extent on the use of tuberculin. About two years ago the Bang system was inaugurated there, and at the present time we have over 600 cattle
under the Bang system. Some of these are being held by the owners, probably 200 or 300. The remainder, having been appraised and the original owners compensated, are being held under the direction of the state. We have recently tested twenty-nine young animals ranging in age from five to twelve months the offspring of forty head (held under the Bang system), all of them were apparently free from disease.

In another case we tested nine calves, the offspring of reactors, and three reacted. The conditions under which these calves were held were not very satisfactory. The man in charge not being very competent, probably did not take the precautions necessary. In the other case, the herd was in charge of a competent man. The young animals were fed pasteurized milk from the mothers and they were kept under very satisfactory conditions. We have quite a number of other young animals in the state which will be tested shortly, and we hope that a good number of them at least will prove to be free from tuberculosis.

A Member: And at what age do you test young animals?

Dr. Wills: We do not recommend testing under six months. Six months to a year old. As a rule they are six or seven months of age. In our state the law provides that milk from reactors may be used for any purpose if heated to a temperature of 185 degrees Fahrenheit, and that is the temperature to which the milk was heated before being fed to the calves, and as a rule the feeding of that milk was satisfactory.

None but clinically sound animals are allowed to be kept under the Bang system. We do not recommend, however, the keeping of any but thoroughbred cattle.

Dr. Cotton: Dr. Wills, will you please describe what a clinically sound cow is?

Dr. Wills: A clinically sound cow according to our interpretation of the word is an animal which shows no visible evidences of disease by a physical examination. If the veterinarian can detect anything that might be tuberculosis, the animal is not kept for breeding purposes, and a representative of the state has full control as to what shall or shall not be kept. We do not want to kill a specially valuable animal, but if the state representative says that she has tuberculosis, she is destroyed.

A Member: These clinical cases, are they reactors?
Dr. Wills: Yes.

A Member: You test the whole herd?

Dr. Wills: Yes; and any that are apparently sound, although they may react, may be kept under the Bang system.

A Member: If they show clinical evidences and do not react?

Dr. Wills: They are destroyed; they are not allowed to be kept. I think Dr. Ravenel referred to having a standard as to what should constitute a reactor. I agree with him that it is impracticable to fix a standard as to what shall or shall not constitute evidence of tuberculosis by means of a subcutaneous injection of tuberculin. I believe the veterinarian on the ground is better able to judge of the reaction than is the man who does not see the animal; and for that reason, in New York or wherever it may be, I would take the judgment of the person making the test, although we ought to have a standard technique to be followed in conducting the test.

A Member: Do you think that a veterinarian can diagnose a case of tuberculosis from a clinical examination?

Dr. Wills: I think if he is competent he can. The great difficulty in the control of tuberculosis under the Bang system is the lack of knowledge of the physical examination—I am speaking for New York State in this case—I think that if we were better educated along the line of physical examination, that the control of the disease would be much simplified. At the present time we are handicapped by a lack of competency in that respect, and veterinarians are depending on the tuberculin when our regulation requires a careful physical examination before beginning the test, and the result is that clinical cases are sometimes left in the herd.

A Member: I would like to ask one question. Is it possible to detect by a physical examination an animal that is afflicted with tubercular peritonitis, or tuberculosis of the glands?

Dr. Wills: No, I don't think so.

Dr. Kinsley: Mr. President, I think it is evident from the discussion this afternoon that the control of tuberculosis will require a little different tactics in different locations. Dr. Moore, as well as one or two other speakers, have put the proposition to us as they have it in New York. If I read between the lines correctly, they have a large percentage of tubercular animals, and the slaughter of
all of those animals means a very large economic problem at the present time, and if it is possible through the Bang system to eradicate tuberculosis that way in New York, they can probably do it for less cost than otherwise. At the same time I would agree with what Dr. Ravenel has said concerning a dairy cow that is tubercular. I do not believe that such milk would be relished by anyone who has any knowledge of tuberculosis. Dr. Ravenel suggests pasteurization. It is possible, I believe, to pasteurize milk so that the tubercle bacilli are destroyed, but I do not believe that that work can be done by the ordinary dairy men. I do not think it is a safe proposition.

Another question. Is it possible to entirely eradicate tuberculosis under the Bang system? I do not believe anyone can positively say just the hour, the day or even the week that a cow begins to eliminate the tubercle bacillus in some of her discharges. I believe the Bang system for the eradication of tuberculosis means more or less continual contamination of the premises. True, they say, isolate these animals, but on most dairy farms that I have under observation there are many means of transferring this infection through the premises where the healthy animals are kept, and I am wondering if where this Bang system is recommended if there is some efficient means of disinfecting those premises. I want to suggest that it is not an easy matter to disinfect a barn, and this problem of disinfection is a very important one. In the northern states animals are housed during the winter, and I wonder what is done with the manure. That manure in many cases carries infection, and in some instances hogs are allowed to consume it, and in this way tuberculosis is continually maintained on those premises. So it seems to me to be a question in this big country of ours whether or not we should recommend at this time the Bang system.

The President: If the chair may be permitted, I want to refer to a farm in New York known as the Woodcrest Farm. Three years and a half ago they had something like 110 pure bred Holsteins. On a tuberculin test a little over 60 per cent reacted. They immediately put the non-reactors in a barn that was specially prepared for them about an eighth of a mile away. They kept the infected animals in the old stable. On the last test out of 168 there was one reactor. There was a change from over 60 per cent to less than 1 per cent.

Dr. Gibson: Mr. President, there has been a question concern
ing the Bang method in some specific instances. I do not lay any stress upon the test at the age of six months. My experience in tubercular herds has taught me that you do not get the standing percentage of disease in an animal under two years of age. You do not begin to get it in calves. This method of testing calves at six months of age is not conclusive to me. Raise them to two years of age and test them, and then you will know something about it. The veterinarians of New York are as smart as those of any other state, and yet I doubt if a veterinarian in the State of New York could pick out a tanker on a clinical examination, and I do not think there is a veterinarian anywhere who would say that a tanker is a fit animal to be in a herd.

Dr. Cotton: Mr. President, I have listened to these discussions today with a good deal of satisfaction. I went away from our meeting last year with a wrong impression of Dr. Moore's position. Dr. Wills has cleared it up today. I was under the impression last year after listening to Dr. Moore’s paper that in New York, because of the immense number of tuberculosis cases in the state, they were going into the herds, picking out the clinical cases, destroying them and leaving the rest. I am satisfied that the Bang system, where the farmer is able to financially carry it out, is the system. I have charge of one herd in Minnesota that has been under the Bang system for nine years. Ninety-five per cent of the herd were diseased. During the past seven years we have only had two calves from the Bang herd react. It has been very satisfactory, but the owner of the herd is immensely wealthy. He built separate stables for the Bang herd; we take charge of the calf immediately after it is born, generally gave it one suckling and then put it on a clean mother or else gave it pasteurized milk from the Bang herd.

Dr. Reynolds: Mr. President, it seems to me that we should bear in mind while discussing the Bang system that practical experience all over the United States and Canada has shown beyond any possibility of a doubt that it is absolutely impracticable except in herds where the offspring is especially valuable, and that limits it to pure-bred herds, and the high grade herds that have been carefully bred up. When we remember that the pure bred herds of the entire country constitute somewhere around 2 per cent of the cattle of the country, the Bang system has an exceedingly limited possibility. I have been disappointed somewhat that the line of topics brought out in Mr. Glover’s paper have not been more generously discussed, the possibility of utilizing the great factors that we have
in this country for public education, particularly the education of
the agricultural people along these lines.

Dr. Knowles: Mr. President, in Montana we are giving exhi-
bitions of the slaughter of cattle in various cities and we always
have a large attendance. We find it is quite an educational feature
and one that has made public sentiment largely in our favor. Two
years ago our legislature passed a law providing for the appoint-
ment of four officials to test the dairy herds of the entire state. Up
to date we have tested 5,790 dairy cows. They found 512 reactions
and 186 were placed in quarantine.

I will state that this law was a rather anomalous one, which
permitted owners to either sell for slaughter or quarantine. Some
of the dairy men have availed themselves of the quarantine, feeding
their cattle so that they can get them fit for slaughter.

In Butte we had at one slaughter six hundred visitors, and they
had to walk about a mile and a half from the end of the street car
line. In Helena we had about 230, and in Missoula about the same
number. In Great Falls we had about fifty. Our greatest difficulty
in dealing with tuberculosis in the dairies in Montana is with the
foreigners. We have a heavy foreign population in Butte, mostly
Italians, and they are refractory.

Dr. Leech: Mr. President, I believe that there are none in this
room after this discussion that are even skeptical enough to believe
that the tuberculin test is so simple that it does not require the
most expert diagnostician to insure accurate results. Should one
man go away from here with that impression I would not think
much of his capacity for education. Last year we had men here
advocating that satisfactory tests could be made by students. I see
none of those gentlemen here today. They evidently have begun to
realize that the question of tuberculin testing is not a mechanical
matter, but requires the knowledge of an expert.

New York has been getting a good deal of credit and a good
deal of criticism. I want to say that I discovered in New York ideas
which I have been carrying in my mind for some time; it is being
worked out there; that is the question of the elimination of tuber-
culosis in districts. I found near Homer, N. Y., a man by the name
of Charles J. North, who is supplying a certain district in New York
with milk. He first started out with the idea of supplying his milk
alone, but his product was so good that he was obliged to call in
help from outside sources, so he began with the idea of paying a
premium for tuberculin tested milk, paying one cent a quart premium for milk from tuberculin tested cows, with a low bacteria count. He says that today in his locality he can get more milk than he can use. People are anxious to furnish it when they see the difference between the checks at the end of the month coming into their pockets, and they are perfectly willing to test; you don’t have to use any force.

Dr. A. D. Melvin here read the following paper on “Summary of Methods and Results to Date with Suggestions”:

TUBERCULOSIS—SUMMARY OF METHODS AND RESULTS TO DATE, WITH SUGGESTIONS.

I believe considerable progress has been made during the past year in the work against tuberculosis, although not much of a definite and specific character can be shown. The progress has been more in the nature of extending information regarding the disease than the actual cleaning up of herds. A valuable feature of this educational work is the literature prepared by an international commission of the American Veterinary Medical Association on the control of bovine tuberculosis. This commission made a report recommending certain definite methods to be followed, and afterwards prepared an admirable treatise presenting in a concise and simple way the main facts about the disease. Both of these papers have been printed by the United States and Canadian Governments and are being widely circulated. The information thus disseminated should prove a valuable means of preparing the way for practical work in eradication.

The tuberculin test is now required by forty-two states, or all but six, as a condition to the admission of breeding and dairy cattle. The only backward step has been in Illinois, that state having repealed the tuberculin test requirement. The only other states that do not require this test are Rhode Island, West Virginia, Ohio, Florida and Nevada.

As the work of testing cattle for interstate movement progresses it becomes more and more evident that a large number of practicing veterinarians are not familiar with the tuberculin test and are not able to interpret properly the results which they get. Some do not know just how the test should be carried out, and even when it has been properly applied there is a possibility of an error of judgment in interpreting the temperatures and determining whether or not there has been a reaction. State veterinary associations can help to remedy this deficiency by giving more attention to the subject. At these meetings the actual methods of making the tuberculin test and the interpreting of charts should be discussed more than has been done heretofore. It would also be well if clinics were held at which a number of cattle would be tested and then slaughtered and examined post-mortem. A prominent veterinarian recently informed me that in his opinion a very small proportion of practicing veterinarians in his state full understood the test, and he wished to arrange for the Bureau of Animal Industry to conduct a demonstration for the benefit of these veterinarians. This seems to be a move in the right direction, and I wish it could be extended throughout the country.

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In considering the tuberculin test, which has been found to be so exceedingly accurate when its results are of a positive nature, we must not overlook the value of physical examination. It is known that advanced cases sometimes fail to react to tuberculin. It is therefore very important that the physical method should be used in addition to the tuberculin test, as physical examination will enable one to detect the disease in many cases which are so badly affected as to give but slight reaction or none at all to tuberculin. By combining the two methods practically all cases in whatever stage can be detected.

There is need for greater care to prevent the reappearance of tuberculosis after the affected animals have been removed from a herd. It is very discouraging for the stock raiser who has made an honest effort to get rid of the disease at a great expense to find in a short time that it is again prevalent. Every effort should be made to protect such men in their undertaking. To get rid of the infection it is necessary that the premises that have been occupied by affected animals should be properly disinfected. Much of the so-called disinfection is done in a superficial and perfunctory manner and leaves many germs lurking in the stable to perpetuate the disease. The work must be done with great care and thoroughness if it is to be effective. The Bureau of Animal Industry has prepared a circular, which will soon be issued, giving directions for the disinfection of stables, and I shall be glad to furnish copies to interested persons.

After diseased animals have been removed the owner usually desires to replenish his herd, and here again great vigilance is necessary to guard against the reintroduction of the infection through new stock. I recommend that all new cattle should not only have passed the tuberculin test, but that they should be segregated for at least three months and then retested before being added to the main herd.

We all know that unscrupulous persons sometimes attempt to nullify the tuberculin test and sometimes falsify certificates or charts. I should like to see a law in every state requiring the forfeiture of the right to practice veterinary medicine as a penalty for any veterinarian issuing a false certificate or test chart or treating cattle in any way so as to prevent a true reaction.

The recommendations made by the international commission of the American Veterinary Medical Association should be a sufficient guide for every veterinarian in attempting to eradicate the disease, and I commend this report to careful study by all officials and practitioners who are concerned in any way in dealing with the tuberculosis problem. The commissions report has been published as Circular 175 of the Bureau of Animal Industry, and copies may be obtained on request.

The Department of Agriculture now has under consideration the question of requiring the tuberculin test of all cattle shipped interstate for breeding or dairy purposes. I realize the magnitude of such an undertaking and for this reason hesitate somewhat in urging its adoption. However, I believe that the time is about ripe for this step. While it is a violation of the Federal law to knowingly ship tuberculosis animals in interstate commerce, there is no doubt in my mind that a great number of diseased animals are shipped interstate, the difficulty being to obtain evidence that the per-
son making the shipment had knowledge that the animals were diseased.

The Department has been urged from several sections to permit the interstate shipment of reacting cattle to market centers for slaughter under restrictions. At present there is no authority to permit such shipments, and it would require the modification of the present law to do this. It has been quite a question in my mind as to whether this might not result in more harm than good. The only benefit to be derived is in certain states which are rather large producers of cattle, but which have few slaughtering centers.

It has been suggested to the Department that an impetus could be given to the establishment of clean herds through the Department establishing a commission to certify to herds that have been freed of the disease under the supervision of the Bureau of Animal Industry and in accordance with the rules established by the commission. The benefit which a breeder would derive from obtaining such certification is obvious, and it is expected that such a commission will be provided. The main purpose of the commission, for which the name of National Bovine Tuberculosis Commission is suggested, would be to assist cattle breeders in their efforts to secure, maintain, and perpetuate cattle free from tuberculosis by the following means:

1. Detection of the disease by modern and reliable methods.
2. Elimination of infected animals from the herd.
3. To guard against reinfection of the herd by subsequent purchases of infected animals.
4. To recognize officially the owners of cattle herds which are free from tuberculosis.
5. To provide for the identification of individual animals in such herds, and to establish and maintain an official register of all such cattle, through the maintenance of a permanent office in charge of the secretary of the commission.
6. To cooperate with the officials of the purebred live-stock record associations, state veterinarians, state live-stock sanitary boards, and public health officials.

I should be pleased to hear a full discussion of the advisability of establishing such a commission.

Dr. Luckey: Mr. President, it now seems to be the general idea that the tuberculin test is not a purely mechanical appliance to be used by students, farmers and herd owners. In our state we have two men who have devoted the greater part of their time to making tuberculin tests for the past three years, and we are just now beginning to get accurate results, and accuracy requires skill in applying the tests, and judgment in interpreting it; but all of this must be supplemented by a certain knowledge of the herds tested, as history must often guide us to conclusions. Under our plan veterinarians go into a community and they soon find out where the
disease is located and they use the history of the individual herd or herds, as the case may be in drawing a correct conclusion as to the result of the test.

In Missouri the license of any veterinarian will be revoked if he passes a tubercular animal for sound, provided there is not some reasonable excuse, and we have put them on guard against cattle being treated in any manner to obviate the result or modify the result of the test.

The meeting adjourned to Wednesday, December 6th, 1911, at 9:30 o'clock a. m.

WEDNESDAY, DECEMBER 6, 1911.

Convention called to order by President DeVine at 9:30 o'clock a. m.

The President: Dr. A. W. Miller, of the Bureau of Animal Industry, who was to read a paper on dourine, and Dr. J. I. Gibson, of Iowa, who was to discuss it, were omitted in printing the program, so we will now have Dr. Miller's paper.

DOURINE IN HORSES COVERING INVESTIGATIONS IN IOWA.

By A. W. Miller.

It is the purpose of this paper to cover only the work of locating animals affected with and exposed to dourine, and the procedure in eradicating the disease. No attempt will be made to undertake a technical discussion.

On May 27th, 1911, the Bureau of Animal Industry received a letter from Dr. J. I. Gibson, State Veterinarian of Iowa, stating there was an outbreak of a disease in Taylor County, Iowa, suspected of being dourine, and requesting detail of an expert to make an investigation. The disease was first reported by Dr. A. H. Quin, a practitioner of Creston, Iowa. Federal and State veterinary inspectors located several affected animals and on June 15th diagnosis of dourine was confirmed by Dr. A. D. Melvin, Chief of Bureau of Animal Industry and Dr. John R. Mohler, Chief of Division of Pathology of above Bureau. Arrangements were made immediately by Dr. Melvin, Chief of the Bureau and Dr. Gibson, State Veterinarian, for controlling the disease; bureau agreeing to furnish inspectors to work in conjunction with such inspectors at the state might be able to furnish; the state agreeing to quarantine all affected and exposed animals. This quarantine provided that the owners of quarantined animals should not use them for breeding purposes, nor sell, trade or dispose of them, but might use them for working purposes.

The method of locating affected and exposed animals will be first considered and later the procedure adopted in eradicating the disease:

On June 16th this work was commenced by Federal and state inspectors. We began tracing the course of the disease from several stallions and mares
known to be affected and which were already under quarantine. All mares bred to any of above stallions present year were immediately inspected and quarantined. A list of these mares was secured from stud books of stallions. Also all stallions which during present year had served mares known to be affected were inspected and quarantined. This information was secured from owners of affected mares, and I wish to state that farmers and horsemen in region where infection existed, with but few exceptions, furnished every possible aid to facilitate the work of inspection. The quarantine of these two classes constituted quarantine for first or direct exposure.

At time mares were quarantined on account of direct exposure, information was obtained from owner of each exposed mare as to whether his mare had been served subsequently by another stallion, and where this was found to be the case that stallion was also quarantined.

Also the stud books of all stallions quarantined for direct exposure were checked and all mares found to have been bred after stallion had been exposed were quarantined. These two classes constituted those quarantined for second exposure.

The stud books of all stallions quarantined on account of second exposure were then examined and all mares found to have been bred to such stallions subsequent to their exposure were quarantined; this constituted quarantine on account of third exposure and is the extent to which quarantine was carried. No positive evidence was found that any mare quarantined on account of second exposure had been bred again before we were able to place her under quarantine, and no mares quarantined on account of third exposure had been bred again. The following example will be given to show the necessity of carrying the quarantine to third exposure; the imported stallion Trotteur was bred late in March to a bay mare named Pet; Trotteur was at that time affected with dourine. On May 15th Pet was bred to the grade stallion Mack: after May 15th Mack was bred to nineteen mares up to June 15th, when he was quarantined. Pet developed infection four or five weeks after service by Trotteur, and on June 28th, about six weeks after serving Pet, Mack showed characteristic symptoms of dourine. So far none of nineteen mares bred to Mack after May 15th have developed disease, but one can readily see the possibility of one or more of the mares contracting infection from Mack, and if not quarantined, furnishing a new center of infection.

The necessity of locating and quarantining affected and exposed animals with as little delay as possible is emphasized, as every day's delay means more exposure and the liability of having more sources of infection to combat. If this outbreak had been detected sixty days earlier the quarantine of many and destruction of several valuable animals would not have been necessary.

The work outlined above was about completed by June 24th. By this time information so far obtained indicated that source of infection was either from one of six stallions or from one of three mares, as all other affected animals found, appeared to have contracted their infection present year. Two of these stallions at that time were in another state. Both were suspected of being possible starting point of infection, owing to getting no foals while standing in the vicinity where this outbreak occurred during 1909, and also the statement of several parties that one or both appeared to be
suffering from some venereal disease. These two stallions will be hereafter referred to as Nos. 5 and 6; the other four as Nos. 1, 2, 3 and 4, and the three mares as A, B and C. From all evidence obtained stallions 1, 2, 3 and 4 and mares A, B and C were all undoubtedly affected prior to 1911. It was therefore necessary to go back to 1910 breeding of these animals for origin of outbreak. It was found by tracing mares bred to them that stallions 1 and 2 got a very large per cent of mares in foal, and inspection of these mares showed but one case of infection. This was mare A. This mare foaled a healthy colt in 1910 by stallion No. 1. It was found that this mare had been bred by stallion No. 3 about August 20th; three weeks later to stallion No. 2 and three weeks later to No. 1. From history obtained it appeared reasonably certain that No. 3 was diseased when he served mare A; that she was infected by him and in turn communicated the disease to Nos. 2 and 1 in order named. This was about the last mare bred to either of these stallions in fall of 1910. We had thus eliminated stallions 1 and 2 and mare A as original source of infection.

Stallion No. 3 was bred to twenty-nine mares in 1910 without getting a single foal and in tracing mares bred to him we found several mares affected, apparently tracing their disease to him. Among these mares were B and C, mentioned above. After thorough investigation it was decided mare B received her infection from this source, but from statement of her owner mare C was undoubtedly affected prior to 1910. This left mare C as possible source of stallion 3's infection.

Stallion No. 4 was diseased during 1910 and served no mares. Stallions 5 and 6 did not stand in this locality after year 1909.

We now go back to year 1909 with stallions 3, 4, 5 and 6 and mare C as possible starting point of infection. Nothing could be found to indicate that stallions 3 or 4 were affected in 1909, as from checking their stud books none of the mares bred to them during that year were found affected or an; history to show that any of these mares had died from disease resembling dourine, and it was also found that they had gotten a fair number of foals from 1909 breeding. We then turned our attention to mare C, and it was discovered she was bred to stallions 5 and 6 in 1909, in order named. These stallions were both imported that year from France. No. 5 was traced to another state, found to be in good health and a good breeder. No. 6 was also traced to same state as No. 5, found not to have gotten a mare in foal since being imported, showed symptoms of dourine, was destroyed, and ante-mortem diagnosis confirmed by post-mortem and pathological examinations.

The mare C undoubtedly owed her infection to this horse, as it appears she showed no signs of infection until after being served by him, and stallion No. 3 traces his infection to mare C, while stallion No. 1 probably owes his infection to some mare previously served by stallion 6. It was reported that stallion No. 1 served mare C, but we have been unable to verify this report; if this were true it would account for his infection.

After leaving Iowa stallion 6 had fortunately been bred to very few mares. One of these mares had died from disease resembling dourine. Remainder of mares are under observation, and all stallions which have served any of these mares since service by stallion 6 have been inspected. It appears reasonably certain that stallion No. 6 brought infection from France.
Mares bred to affected stallions in 1910 were not quarantined on account of time which had elapsed since service, unless found affected or suspicious. One of these mares infected during 1910 breeding was found to have been served by another stallion and also a jack in 1911, and quarantine was carried to second exposure as outlined before. Luckily no case of third exposure from this breeding occurred.

During the time this work was being prosecuted and after it was finished every stallion that stood in infected area in 1910 and 1911 was traced, inspected, and stud books of such stallions examined to ascertain if any of them had been bred to mares which had been found affected. In addition all mares bred in 1910 to stallions which were known to have been suffering from the disease during that year were traced and inspected. This work necessitated tracing animals as far north as Wisconsin, east to New York, south to Texas and west to Nebraska.

In addition to animals quarantined, many other animals which exhibited no symptoms of dourine and no evidence could be obtained that they were exposed; are yet being kept under close observation on account of suspicious circumstances which indicated they might possibly have been exposed. At present time it appears that at least one of these animals is developing symptoms of dourine. A large number of animals reported suspicious by veterinarians and stockmen at various points in Iowa were inspected, but no cases of dourine have been found among animals thus reported.

As soon as work of locating and quarantining affected and exposed animals was completed, a reinspection of all quarantined animals was made every month or six weeks. The necessity of such reinspections was amply proven, as several animals at one inspection showed characteristic lesions of dourine which on both previous and subsequent inspections showed practically no symptoms of disease. It is the intention to continue these reinspections, and all directly exposed animals are to be kept in quarantine at least during 1912 by Iowa authorities, and probably those with second and third exposure for same period.

We will now consider the procedure adopted in eradicating the disease:

As no cure has been discovered for dourine all affected animals are being slaughtered. Unfortunately the State of Iowa had no available fund from which owners of affected animals could be indemnified. The Governor of Iowa requested assistance from the Secretary of Agriculture, and Secretary Wilson agreed to furnish the necessary financial aid for the eradication of the disease. A maximum price was fixed to be allowed for any animal slaughtered and the prices paid were graduated downward from this maximum, depending upon actual value of animal when killed. After being purchased affected animals were slaughtered and buried under bureau supervision, post-mortems being held on every animal slaughtered to verify ante-mortem diagnosis. The payment of a small indemnity, taking into consideration every phase of the question, is undoubtedly the cheapest way of eradicating a disease as insidious in its nature as dourine.

Very little friction was encountered in the slaughtering and burying of animals. Several had died of the disease and several more were nearly dead when eradication was commenced, and owners of affected animals were naturally anxious, having seen the course the disease takes, to obtain a little
indemnity, realizing that if they did not sooner or later the animals would die on their hands. With one possible exception no attempt has been made to break quarantine. Dr. Gibson, state veterinarian of Iowa, has rendered valuable assistance in eradicating the disease by maintaining an effective quarantine.

It is the present intention if possible to purchase and destroy all exposed stallions and jacks, or in certain cases, if deemed advisable, to secure castration of these animals instead of slaughtering them, in order that no possible source of infection may be left to start another outbreak. While the disease has not as yet been entirely eradicated, we feel that it is under complete control.

Dr. Gibson: Mr. President, Dr. Miller has covered the ground so thoroughly that there is but little left to be said on the subject. I do not know what we would have done without the assistance of the Bureau of Animal Industry and the Department of Agriculture. I think it was rather lucky for Iowa to have furnished the Secretary of Agriculture.

Now, as Dr. Miller said, everything exposed up to the third exposure is in quarantine and will remain there as long as any taint of suspicion rests upon those animals. There will be absolutely no chances taken in the State of Iowa with any mare, stallion or jack whose history is not perfectly clear in this outbreak. We had a discussion here yesterday about physical examination to determine the existence of bovine tuberculosis. You know what my ideas are on that point. I contend that the detection of dourine in all cases, would be as difficult as the detection of tuberculosis on physical examination, and for that reason I will guarantee you that Iowa will never knowingly let go of a suspicious animal.

The President: The next will be a paper by Dr. G. M. Whitaker of Washington, D. C., "Sanitary Handling of Commercial Milk."

SANITARY HANDLING OF COMMERCIAL MILK.
By Geo. M. Whitaker.

Commercial milk may be contaminated in two ways—first, by unhealthy animals, and, second, by unhealthy conditions in handling it. Hence work for improving market milk must be along two distinct lines. There must be efforts to secure more healthy animals and also to get better conditions of handling the product. These two lines of effort should go hand in hand, as both are important, and no comparisons between the two should be drawn; but this is sometimes unavoidable, especially when legislation is concerned. Law is not a laboratory product. It is a reflection of public opinion and represents popular intelligence. The scientist finds a fact in the test-tube or discovers a truth under the microscope, but facts and the truth are useless as a basis for law until they are diffused among the people. Popular sentiment frequently lags far behind science; that is truth.
the Dairymen's Association of the county in Kentucky where the State Agricultural College is located decided by a unanimous vote against the tuberculin test as dangerous to the life of the cows and not giving conclusive evidence of the presence of tuberculosis. Sometimes popular sentiment is ripe for legislation looking to cleaner milk when it will not tolerate a tuberculin test law and vice versa. Sometimes we are asked in cases where popular sentiment is not ripe for an ideal law—which line of activity is really of most importance. And while I do not like to draw a line between the two kinds of work, regarding each as very important, I feel compelled at times to say that as between two evils I would prefer a glass of clean milk from an untested herd to a glass of dirty milk known to be free from germs of tuberculosis, and I would be influenced by the same prejudice in securing milk for my family. I also feel that probably more babies die of various forms of summer complaint, so called, and intestinal trouble due to dirty milk than from tuberculosis transmitted from the bovine race through the milk supply. I do not like to draw a cold-blooded balance in such a serious matter, but I am somewhat of a believer in the theory of a half loaf being better than no bread. When such states as Indiana, Illinois and Wisconsin take backward steps in regard to tuberculosis I feel that we ought not to give up all effort for improving the milk supply in those states because of the low state of popular intelligence relative to one phase of the work. In the educational work which must always antedate legislation, it is usually easier to create a sentiment in favor of clean milk than in other directions. The average person can understand what clean milk means where he may be skeptical as to the advanced teachings which are based on investigations relative to germs seen only under powerful microscopes. In some localities where I have had occasion to work the uplift of the market milk supply has been temporarily set back by bringing the tuberculin test to the front in advance of popular sentiment and by the failure to comprehend the importance of both phases of work. We should not magnify the importance of the tuberculin test so as to insist upon that or nothing. It has been said that it would be very unwise to labor for a law against stealing in a community of thieves, and therefore it seems to me to be wise to labor directly for such legislation as public sentiment will stand for, carrying on meanwhile a campaign of general, all around education.

The principal involved in the sanitary handling of commercial milk is extremely simple, but the application is what causes trouble. At a recent meeting of milk producers for the Boston market resolutions were adopted somewhat critical of the modern movement for cleaner milk and calling attention to "the proverbial neatness of the New England farm families," but a great deal of the trouble in the work for more sanitary handling of commercial milk lies in the changing definition of the word "neatness." With increasing knowledge of bacteriology the word "clean" has an entirely different force from what it did a few years ago. The old-time surgeon was not conscious of being disgustingly filthy when he lanced a minor abscess with his jack knife, having taken the precaution to clean it by wiping it on his pocket handkerchief, but the methods of the "clean" surgeon half a century ago would convict him today of malpractice. This same, shifting idea of the word "clean," is noticeable in domestic work where the feather duster age has passed, to be succeeded by the vacuum cleaner age in which dust instead of being merely stirred up is sucked into a removable receptacle and taken from the room.
The desideratum in handling commercial milk is to have it reach the consumer with only a small number of bacteria. The fundamental principle involved is simply one of cleanliness, although prompt and efficient cooling must be coupled to this, because many forms of bacteria multiply when milk is at a high temperature. But the whole effort at improving the sanitary quality of milk is one of reducing the number of bacteria.

A fundamental principle in the handling of commercial milk is that it must come in contact with the air as little as possible. Much of the contamination of milk is from bacteria which are on the dust in the air. Dust is omnipresent, and hence the less milk is exposed to the air the better.

The ideal way of handling milk so far as bacterial contamination is concerned is to get it immediately while warm into cans and bottles, carefully close these and then submerge them into ice water. This point in connection with the handling of milk is not understood as well as it should be and much popular misapprehension prevails on this subject. A dairy publication dated as recently as October, 1911, contains an article by a state dairy inspector criticising many of the producers that he visited because “they put the hot milk in the can and put on the cover and then set the air-tight cans in the water.” “I also found,” he says, “not a few cases where the hot milk had been bottled, the caps put on and the bottles set into water for cooling, leaving no chance for escape of the animal heat.” Animal heat is not a material substance which will remain an unwilling prisoner unless given an opportunity for escape.

This danger to milk from contact with bacteria-laden air is the reason for condemning the dipping or pouring of milk on the street. The advice to keep milk from contact with the air as much as possible is of universal application, whether we are considering dairying from the standpoint of the producer, the middleman or the housekeeper.

But it is not possible to avoid some contact of the milk with the air under ordinary conditions of handling, hence the milk must be produced, prepared for market and marketed in as clean air as possible. The stables ought to have cement floors, which can be kept clean better than if constructed of other materials, and stanchions built in such a way that there will be as few dust-harboring opportunities as possible. There should be smooth, tight ceilings and walls for the same reason. Incidentally, this form of construction helps to fight the plague of tuberculosis, for stables so constructed can be much more easily disinfected than those which abound in germ-concealing angles and cracks and dust-gathering surfaces. A great deal of dirt can be kept out of milk by using the hooded milk pail, which restricts greatly the open space, and thus reduces materially the possibilities of dirt getting into the milk. The milk should be drawn from cows whose flanks and udders have been cleansed by wiping with a damp cloth, and the milk should be clean hands and special overclothes for milking which are kept clean. The housewife thinks that ordinary decency compels her to wash her hands before mixing bread. The milk producer should look upon the production of milk as the production of an article of food and his methods should be as clean as those which prevail in his kitchen. When the milk has been drawn from the cow it should be removed at once from the stable in the milk pail. It should not be poured into the can in the stable air. It should be taken to a clean milk room with smooth sides and ceiling, used only for handling of milk, which is never a place for storage of mis-
cellaneous articles and which is not only provided with fly screens, but from which the flies are actually excluded. This milk room should not open directly from the barn. Here the milk from different cows can be mixed so as to secure a product of uniform composition; cooled, put in cans or bottles and placed in cold storage till needed for delivery. The working out of some of the details of the milk room will depend upon whether or not the milk is sold by the producer, in bottles or delivered by the can.

Another matter of importance is the cleanliness of the utensils, and by that I mean cleanliness in the bacteriological sense of the word. Not so many years ago it was possible to find dairy utensils—pails, strainers, cans, etc.—which were immaculately clean from the superficial standpoint and yet having open seams full of bacteria-reeking dirt which would contaminate the milk and furnish excellent means of spreading epidemics of contagious diseases in case a typhoid germ from the hands of the person who washed the utensils or from the water in which they were washed should come in contact with them. These conditions are improving, though the ideal has not been reached as yet, and it was not so very long ago that a rusty milk pail was found at an agricultural college dairy with a hole in the bottom which had been filled by drawing a wad of cloth through it. An abundance of steam or boiling water should be used in cleansing the utensils. After they have been washed and scalded, never use the old-fashioned wiping towel; invert the utensils and allow them to drain and to dry from the heat of the scalding water. Then they should remain in the inverted position to prevent contamination falling into them, until they are used.

These principles relating to the sanitary handling of commercial milk, or to dairy sanitation, apply alike to producer, distributor and consumer. Keep the milk away from the air as much as possible, when exposure is necessary let the air be as pure as possible, sterilize all the utensils and bottles with which milk comes in contact every time they are used. Keep flies away from the milk. Keep the milk cool from producer to consumer. Be sure that all who have anything to do with handling milk are free from any infectious or contagious disease. But quality in handling milk is a matter of degree. An excellent method of inspection for improving conditions and recording the degree of progress is the score card system. It is in essence a system of rating dairies so that we can allude to their conditions as specific exact mathematical terms rather than in vogue generalities. To speak of a certain dairy as 'good' or 'bad' is usually meaningless, because there are many standards and many degrees of goodness and badness. A dairy that scores 70 (100 being perfect) is usually satisfactory. Certified dairies have scored as high as 95. Although there is a great difference between the figures 70 and 95 this wide range of conditions can be classified in one group as satisfactory or good, while the score of each dairy tells its exact condition. The score cards in general use itemize in minute detail the various conditions necessary in producing milk, assigning a certain number of points to each item. Each item is rated by itself independent of the others and the total gives the score of the dairy as a whole. The final rating is the sum of about sixty different judgments.

From the standpoint of the health officer the score card system brings results in the shape of improved dairy conditions, and brings these results quicker and easier than do other systems of inspection. The files of cards that have been filled out give volumes of information and make admirable
office records. In the larger cities where many inspectors must be employed, some of whom may be less thorough than others, this system furnishes a good method of following their work; if the inspector is required to leave with each dairyman a carbon copy of his score there is a strong probability that the dairy was actually visited and that some attention was paid to each item on the card.

From the standpoint of the producer the system has marked advantages. He can feel that he has received an accurate and impartial score, for with everything written down in black and white the opportunities for error and favoritism are small. If the inspector has tact and talks over with the dairyman the various ratings on the card and the reason for the score he makes, the dairyman becomes interested and is helped by means of the card. If the inspector has sufficient skill to make, not only a reasonable accurate score, but also some suggestions, he becomes a friend and helper of the dairyman and his visits are looked forward to with satisfaction. The score card system is simple and easily understood. The score card tends to prevent misunderstandings to bring nearer together health officer and producer, and to do away with the feeling that the inspector is out to interfere with the milk business and to demand expensive changes.

But with the increasing number of persons who are paying especial attention to bacteriology and being employed as bacteriologists by city boards of health, has arisen a claim that the only inspection needed is bacteriological; and that the Virginia experiment station has within a few days published a bulletin comparing the score card and the bacterial count systems of inspection as found in Richmond, Virginia, confirming the opinion generally held that one corroborates the other when averages are compared. It seems to me that the two systems of inspection should go hand in hand and that one is a valuable supplement of the other. The score card system is the more educational of the two. It interests the dairyman and explains to him what he ought to do. A report to him from a laboratory that the bacteria in his milk are numbered by the millions would be like the voice of one speaking in an unknown tongue. Then again, with the score card system of inspection, bad conditions may be remedied and high bacterial counts avoided. It is a means of prevention further than that, the conditions under which bacteria get into the milk are so many and sometimes so apparently mysterious that the only efficient bacteriological inspection of milk would be one which took samples and made counts practically every day. The scientific research work in the bulletin just mentioned was based upon counts once a month and frequently counts even as often as that are impossible. When dairies are on the border line between mediocrity and downright bad conditions, the count will fluctuate from day to day. Some figures were recently shown me of a dairy in Champaign, Ill., where the counts fluctuated between 20,000 and 5,000,000. Examinations of milk made once a month or less often may not afford as good an indication of the condition of a dairy for producing clean milk as would a score card investigation.

If the precautions suggested above could always be complied with to a satisfactory degree in the preparation and distribution of market milk there would be but little more to say. But some producers will be negligent and when we consider the milk supply of a large city, coming from thousands of farms, this item may be considerable; frequently there is neglect in transportation; in some cases the middlemen are very careless; and it is difficult to determine whether all who handle milk are not typhoid carriers or con-
veyors of other contagious diseases. It would take immense expense to have enough inspectors to do thorough work. Hence pasteurization has been suggested. Through a number of years there has been more or less agitation about pasteurization of milk, growing largely out of the difficulty of compelling the negligent or wilful to comply with reasonable precautions and also from the difficulty of preventing contamination from some of the infectious diseases. When pasteurization was first advocated it was from the selfish standpoint of the dealer in saving losses from sour milk. The bacteria that contaminate milk cause it to sour and if these are destroyed by pasteurization the milk will not sour so quickly and much loss is prevented. The objection was at once raised that pasteurization would put a premium upon dirty milk and upon carelessness. The average producer and handler would say that it made little difference how much dirt and bacteria might get into the milk as all would be destroyed in the pasteurization. This led some opponents of pasteurization to allude to pasteurized milk in a semi-facetious way as 'consome.' Then came the retort "I would rather have cooked bacilli in my system than live animals waiting to pounce upon my health."

Latterly the reasons for pasteurizing milk have undergone a radical change. It is now advocated solely on the ground of the great difficulty of determining whether or not milk has in it germs of infectious diseases. The modern advocates of pasteurization, and they are now in the majority, insist upon milk as clean as possible before pasteurization and this would place no premium upon unclean methods. A recent New York milk conference said that milk for pasteurization should come from dairies that score 75 and have not over 100,000 bacteria. That is excellent milk to start with, much better than the average, and as unobjectionable as raw milk, except for the possibility of infectious disease germs.

One argument against pasteurization in the past has been that it killed the lactic acid germs, those which cause milk to sour, but left alive putrefactive germs, so that pasteurized milk would not sour in the ordinary sense of the word, but would become putrid and dangerous before there were any signs of coagulation. Recent investigations by Mr. Ayers of the Dairy Division have shown that this point is not well taken and that pasteurized milk will sour; it acts like raw milk with low bacteria counts. Consequently, much less can be said against the pasteurization of milk than previously. But the fact is sometimes overlooked that pasteurized milk may be re-contaminated, that while the pasteurization may kill contamination existing in the milk it is not an insurance against re-contamination. I have seen men cap bottles of pasteurized milk with their hands. I visited at one time a pasteurized plant in operation which was situated on the dusty main street of an important city. It was summer, and as the doors were wide open the street dust had unrestricted access to the milk from the pasteurizer which was running over an open cooler and from that into cans which were standing with their covers off during my visit. Mr. Ayers has been working for nearly two years on a plan for pasteurizing milk after it is bottled so as to make re-infection impossible unless by gross carelessness in the home after the bottle has been opened. He has also been working on a plan to run the pasteurized milk while yet hot into bottles and sealing them up before the milk gets below the pasteurizing temperature.
INSPECTION AND REGULATION OF CITY MILK SUPPLIES.

Gottfried Koehler, Chicago.

The inspection and regulation of city milk supplies must necessarily begin at the place of milk production. There is, however, at this time no uniformity of opinion in regard to the question, "Who shall inspect the farms from which the city is supplied with milk?" Quite commonly the cities, for self protection, have been compelled to maintain dairy inspection. Is this as it should be?

The dairy farmer inclines to look upon the city inspector who visits his farm as an intruder and trespasser and has often only reluctantly submitted to this inspection when threatened to have his supply excluded from the city market. Such a relation is not provocative of the best results. There is no question but that the state, of which the producer is an integral part, could more properly and efficiently exercise this authority. It is also quite likely that instruction as to dairy methods, emanating from state officials, would be followed more readily than the same given out by numerous municipal authorities of his own and neighboring states.

But can a city properly control its milk supply by demanding certain standards of cleanliness and purity for milk brought into the city, and leave it to the producer to devise means and methods to produce a milk of the required purity. With conditions prevailing where the producer is obliged to furnish milk with a low bacterial content and minimum amount of gross dirt, he is more likely to invite the co-operation of the national state dairy inspection divisions. The state universities and farmers' institutes would come to his relief, and it is not unlikely that the large retail dealers would put forth additional efforts to instruct their patrons in the methods of clean milk production.

I believe that such a scheme is entirely feasible and practicable. The plan is to establish at least three grades of milk for city supplies.

The first proposed is that of "Pasteurized Milk." All milk brought into the city, or bottling plants and creameries supplying the city shall comply with certain fixed standards of purity. These would be (1) the usual chemical requirements, such as per cent of butter fat; (2) a limit upon the bacterial content, varying with the seasons; (3) maximum temperature allowable; (4) maximum amount of gross dirt permissible in a definite quantity of milk, and (5) possibly requirements as to leucocytes or pus cells.

All such milk shall be pasteurized under strict municipal supervision and would be a safe milk for all ordinary purposes.

For the production of this grade of milk tuberculin tested cattle would not be required. The state veterinarian would make the necessary inspection of the herds to insure that otherwise healthy cattle constitute the herds and that wholesome feed is fed. The farmer would have to employ proper methods to produce a milk of the required standard. Contagious diseases in the dairy districts are to be reported promptly to the proper state authorities. Of this I shall say more later.

Dairy farmers desiring to produce a higher grade of milk and one that may be safely sold without being pasteurized shall apply to the municipal authorities for inspection. If a careful inspection of the herd, equipment,
methods and product shows that a high grade and safe milk is being pro-
duced, then a permit shall be issued. This allows milk to come into the
city and to be handled by the retailer. Inspections of the farm and examina-
tion of the product shall be made at frequent intervals, and the milk, thus
produced, constitutes the second class, which may be called “Inspected
Milk.”

The third and highest class of milk would be a grade now well estab-
lished and known as “Certified Milk.” This would comply with all of the
requirements laid down for inspected milk, but might have a still lower
bacterial count. In addition to the city inspection, its quality would be
certified to by the Milk Commission of the local medical society.

METHODS EMPLOYED IN THE REGULATION OF CITY MILK SUPPLIES.

Of the various methods employed in the regulation of city milk supplies
I shall have time to speak only briefly.

DAIRY INSPECTION.

The dairies supplying the inspected and certified milk shall be rigidly
inspected by the city. A tuberculin test is required of all cattle in the herd.
All reactors are excluded. New animals to be added shall at first be quaran-
tined for a period of at least three months, and then tested with the injection
and ophthalmic methods. These are to be made only by the state veterinarian.
Preferably local deputies shall not do the testing in their own locality.

The equipment and methods shall be scored at least every three months,
or at intervals of a month, if possible. The score card of the Dairy Divi-
sion, Department of Agriculture, is used. A score of at least 80 is required.
The product shall not contain over 100,000 bacteria in the summer, and
60,000 in the winter months. It shall not show more than a perceptible
amount of dirt when a pint of well mixed milk is filtered through a pledget
of cotton, one inch in diameter. The milk shall be cooled immediately after
milking and then be kept at a temperature of 50 degrees F. or below.

The greatest difficulty encountered in the control of this grade of milk,
which is to be consumed in the raw state, is the guarding against contam-
ination with infectious disease producing micro-organisms. This will re-
quire unusual efforts. The recent experiences of Boston, and the many
milk epidemics recorded in literature, all bear testimony on the difficulty of
this problem. We may assume that the milk inspection of the City of Bos-
ton is as nearly perfect as it can be with the usual methods of inspection
employed and the means available for carrying them out. Yet, quoting the
editorial in the November 11, 1911, number of the Journal A. M. A., there
has just occurred an epidemic of septic sore throat in Boston, Brookline
and Cambridge, affecting over 1,000 persons, of whom 48 died, spread by milk
from the Southboro farm of the Deerfoot Company. Winslow, writing in
the Boston Transcript says, “Boston has suffered severe lessons along
this line. In 1907 there were 717 cases of scarlet fever, traced to one
milk supply, and 72 cases of diphtheria traced to another. In 1908 there
there was a milk-borne epidemic of typhoid fever, totaling 400 cases. In
1910 there was another scarlet fever epidemic of 842 cases. Including the
present outbreak, there have been over 3,000 cases of epidemic disease traced
to milk in the immediate neighborhood of Boston in a period of five years.”
I am utterly unable to suggest a practical method to prevent such occurrences. Regular medical inspections of the milkers and others in the dairy farm coming in contact with the milk cannot be made frequently enough to be depended upon. Such inspections could rarely be made at intervals of less than two weeks.

Country practitioners can be depended upon but slightly to report contagious diseases promptly. The dairy farmer should be held to report promptly to the inspector the occurrence of any sickness. I see no reason why he should not give bond, or make affidavit that he will comply with this requirement.

The detection of carriers of typhoid and diphtheria and the early cases of consumption is an important phase of the medical inspection and makes this more complicated.

The producer who has complied with all of these requirements is now given a permit by the city authorities and can sell his product as "Inspected Milk."

The conditions under which "Inspected" Milk can be produced are somewhat analogous to the method the Federal Government employs in the inspection of meat, especially in regard to the option of complying with the requirements or not receiving the inspection.

Examination of the Raw Milk Which is Required to Be Pasteurized.

Farmers supplying such milk must first of all furnish the same comparatively free from gross dirt.

The amount of dirt is easily determined by taking a pint from a well mixed lot and filtering the same through a pledget of cotton, one inch in diameter. This may be done at the receiving station or bottling plant, with specially improvised apparatus. All milk found to contain more than a small trace of gross dirt is rejected.

In addition to this test, especially in the summer time, frequent bacteriological examinations should be made. If possible, the count should be held below 1,000,000. This, of course, cannot be done unless special emphasis is laid on the proper temperature of the milk upon delivery. This should be at least 55 degrees F.

In addition to this, microscopic examinations for pus cells should be made at intervals.

If all of these standards are enforced for raw milk which is to be pasteurized, then the producer will have to adopt better methods, or go out of business. It is thought not at all likely that he will quit, for it is comparatively easy to comply with these requirements if he knows how. But who is to teach him how? I hold that this is not the duty of the cities.

PASTEURIZATION.

Pasteurization must be properly controlled if used as a means necessary to render safe a milk supply that could not otherwise be provided in sufficient quantities to supply the rapidly increasing demand of urban populations. Ordinarily, bacterial standards are set for the pasteurized products. These are unquestionably the most accurate and reliable means.
of control, but when applied practically to the milk supply of large cities, they entail such frequent examinations that the method becomes quite expensive and requires large laboratory facilities and a great number of competent bacteriologists. In this case the question may be raised if the money expended in this manner might not be used for carrying on dairy inspection and thus obtain a product that would be safe without pasteurization. To obviate this the use of simple chemical standards has been suggested. They depend on the fact that milk heated above 176 degrees F. fails to show color reaction when the Stork test is applied. This test is made by adding to 5 c. c. of the pasteurized product two drops of a 2 per cent solution para phenelin-diamin and one drop of a 2 per cent solution of hydrogen peroxide and agitating. The results obtained are not very uniform, and other substances besides peroxide may occur in the milk and give this test.

The time of exposure is also an important factor. Unfortunately milk tested to 140 degrees for 20 minutes still gives the color reaction with Stork's test. Hence the test fails when the holding method is employed.

Physical standards, such as fixing the temperature and the time of exposure are exceedingly valuable, and can be readily controlled. The degree of heat to be applied should be determined and fixed for each type of machine at a point where 99 per cent of all, and all pathogenic bacteria are destroyed. Then an automatic temperature recording apparatus is installed so as to record during operation the temperuter of the pasteurized product as it flows from the heater. Records of the temperature may thus be obtained daily, made in a chamber under lock and key. These are collected each day by the inspector, or may be kept on file subject to inspection at short intervals.

In order to insure a uniform degree of heating it is advisable to equip the pasteurizing machine with a thermostat, to regulate automatically the supply of steam. These can be readily obtained and give good results.

Whenever a holding device is used the time of exposure must be kept under control. Ordinarily the mechanism can be readily changed and thus it becomes necessary to make frequent observations to insure that the product is held the proper length of time. Of the degree of heat and actual time of exposure required, I have not time to speak in detail. A safe guide for such a standard is the degree of heat and time required to kill the tuberrulin bacillus, since it is the most difficult of the pathogenic microorganisms we have to deal with her to destroy.

Summarizing the various methods for controlling pasteurization, one may conclude, viz:

1. A chemical standard cannot be employed because it necessitates the employment of heat in excess of what is necessary to kill pathogenic microorganisms and a large per cent of saprophites.

2. Bacterial standards are useful especially in the control of pasteurization, which is carried out on such a small scale that it would be unprofitable to install proper heat regulating and temperature recording apparatus.

3. Enforcing of a bacterial standard entails a maximum amount of work and yet does not give an accurate indication of the effectiveness of pas-
teurization, inasmuch as the multiplication of bacteria in the pasteurized product continues rather rapidly under ordinary conditions.

4. Physical standards, such as proper temperature regulation and recording of temperature, are most useful in controlling pasteurization in larger establishments, especially in establishments located at places where bacterial samples cannot be taken conveniently.

5. This method of temperature control is not only the most useful and convenient for the health office, but is very serviceable to the dealer, inasmuch as it gives him a graphic record of the amount of heat applied, thus insuring perfect pasteurization without the trouble and delay necessitated by bacteriological examinations.

Lastly, by these physical methods of control the dealer knows that he is placing upon the market a product that has been properly pasteurized and that will pass the bacterial requirements if properly bottled and cared for before delivery.

HANDLING AND SALE OF MILK IN CITY.

All dealers must be licensed annually. A license should not be issued until it has been determined that the place of business is in proper sanitary condition, and the milk to be handled is legal milk. If raw milk is to be sold, then it must be obtained from farms that have previously been given a permit, and whose supply is classed either as "Inspected" or "Certified."

A distinction should be made between a milk depot and a milk store. In a milk depot nothing but milk is handled, and this may be handled in bulk. In a store other merchandise is sold. Such a place is ordinarily not equipped to deal with bulk milk, and the storekeeper rarely knows much about the milk business. In stores milk can be safely handled in bottles only, i.e., all milk sold must be bought bottled and sold in the original package without allowing the same to be opened.

In the licensing of those who are permitted to operate milk depots and engage in the handling, pasteurizing and bottling of milk, I believe that the time has come when the occupation should be licensed in addition to the business.

Those engaged in the occupation of plumber, stationary engineer, fireman, water-tender, embalmer, undertaker, chauffeur, barber, druggists' apprentice or architect are now required in this state, to show by an examination that they are qualified. Then why should the same not be required of those who are to engage in the pasteurization, bottling or care of milk?

As to the handling and sale of milk I shall have time to speak briefly of only two important points: First, the temperature at which the product is delivered or sold must be subject to control. It should be required that all milk must be at a temperature of 50 degrees F. or below, when being transported, sold or held for sale.

Secondly: A record should be kept of all cases of scarlet fever, diphtheria and typhoid fever occurring in the routes of the various milk dealers. When such a record has been kept for a certain length of time, the average number of cases of these diseases per month or week for each five-can route can readily be determined. Any increase over this number should cast suspicion upon the milk supply. Unfortunately, the infection has been occurring
for a week or more before the cases begin to develop and increase on the route of the dealer who is spreading the infection. Therefore, this keeping of accounts with each dealer aids us only in checking an existing local outbreak and rarely in the prevention of the same.

During the past year we have had in Chicago two such outbreaks of typhoid fever, with a total of 8 cases in one and 60 cases in the other, spread in each instance by raw milk. No outbreak was traced to pasteurized milk in spite of the fact that pasteurization is not yet perfectly controlled.

There were only 215 deaths in Chicago from typhoid fever during the first 11 months of 1911, when nearly 75 per cent of the total milk supply was pasteurized, as compared with 340 in 1907, when only a small part of the milk was commercially pasteurized. During this same period in 1907 there were 8,221 deaths of infants under one year of age, as compared with 6,810 in 1911, a reduction of 411 deaths, or 6.6 per cent. In these rates the increase in population is not taken into consideration, thus making the contrast still more marked. There were other factors which might influence this rate, but I believe that the improvement in the milk supply is responsible for a large percent of this saving of life.

The President: The next on the program was to have been Dr. Otto P. Geier of Cincinnati. Unfortunately, owing to illness, the doctor will not be able to be with us. Dr. Vanderslice, president of the Chicago Medical Society Milk Commission, has been good enough, however, to come in and fill this period.

Dr. Vanderslice: Mr. President, I think a little incident that happened as I started to come down here is quite apropos in the introduction here. A little boy about four years of age was coming along leading a small dog, and his elder brother met him and said to him: "Where did you get the dog?" "Oh, Joe gave it to me for nothing." "Well, you got stung." (Laughter).

Two years and a half ago there were three farms receiving certification by the Milk Commission. Within six months that number had been increased to six farms. In the next year we took in two more farms and today we are certifying to the product of eleven farms. During the last summer, when we were certifying to the output of ten farms, there were times when it was impossible to supply the demand for certified milk. Sick children and invalids were then given the preference over other customers.

Certified milk is a milk produced under a certifying committee appointed by the county medical society, and the rules and requirements of that commission are the requirements of the Association of American Medical Milk Commission, which is the Association of all the Milk Commissions in the United States. There are now, I
believe, sixty-seven milk commissions throughout the country. Certified milk has been criticised as a high priced milk. It is a high priced milk. It is milk that sells for fifteen cents a quart, almost twice the price of ordinary milk in the City of Chicago; yet, on the other hand, please remember that the farmer gets about four times the price paid for commercial milk, so that your spread is not due to the distributor, as the cost of bottling, handling and distributing of certified milk is practically the same as the commercial milk, and the farmer gets the difference. If it is a high priced product it is a natural consequence, but as soon as the farmer can produce this milk at a lower price your price is bound to come down, so I say that fifteen cents per quart for certified milk is far nearer the exact value of your milk than is the eight-cent price for commercial milk.

The City of Chicago is using about 27,000 pints of certified milk a day. Now, that is infinitesimal compared with the great amount of milk that is sold. But I want you to know that the sale of the certified milk has been doubled in the last six months, and that it has been quadrupled in a year and a half, so that if we keep on with that same geometrical progression it will not be so very long before certified milk will not be so infinitesimal as it is now, but that to me is not the great point with certified milk.

I believe that it can be proven without any special effort that in the neighborhoods in which certified milk is produced the factor of imitation is taking place, and that all the surrounding farms will gradually be improved. You know that the ordinary producer of milk looks upon bacteria as simply bunk. He cannot understand why bacteria multiply so rapidly, and yet it is a fact that where certified milk farms are developed you have them in groupes. We have a group of certified farms in Waukesha County and around Clarendon you will find another group, and see the imitation. Other farmers come in and say: "I hear you are getting nine cents a quart for your milk. What are you doing to get the money? Let us see." And they go through the plant and see how little change in procedure is necessary, what a small amount of outlay of capital is necessary to change their farms which are producing commercial milk to a certified milk, so there is a building up all the time.

The production of certified milk does not need an enormous outlay of capital. I admit that in this district the greater proportion of the producers of certified milk are rich men who have the farm as a toy. On the other hand, I can take you to farms sending
milk to this market on which only the sum of $1,600 was spent in changing an ordinary barn into a barn which was acceptable to the Milk Commission. I can show you other farms on which the farmer has put in eight, ten and fifteen thousand dollars. I can also show you where the bacterial count of the farmer with the $1,600 improvement will rank quite as well as any other farmer.

Last year on one farm ninety per cent of the counts were less than 5,000. Another farm had 80 per cent; one 70; one 65, and one 60 below 5,000. Bacteriological counts are taken every week. We have three bacteriologists working for the Commission, taking counts at such places as the Secretary of the Commission assigns them to, so that every safeguard is thrown around our count that is possible, and these counts are made as the milk is delivered to the customer, not as it is bottled.

Now, I am a certified milk man. I believe in certified milk; I believe in a safe, clean, raw milk. I believe that is the star to aim at, and I believe there is nothing that will raise the standard of your commercial milk so much as a propaganda for a safe, clean, raw milk, along the lines of the certified product. I thank you.

The President: We are very fortunate to have heard Dr. Van- derslice upon this very important subject.

We now have one who needs no introduction, his name is national in connection with the protection and handling of city milk supplies. Dr. Evans will now address us on the general summary of this milk question.

Dr. Evans: Mr. Chairman and gentlemen: I find it exceedingly difficult to summarize a discussion that I have not heard, and in consequence the only thing that I can do is to talk to you more or less generally on the subject of a control of a city milk supply. Had it been possible for me to have heard the papers that were carried on your programs I feel that probably I would be of more service to you than I can be under these circumstances.

There are many problems connected with the milk question that are pretty nearly insurmountable. I do not know of anything on which there has been a greater diversity of opinion than the solution of those problems. The solution from an academic standpoint is so easy, and the solution from a practical standpoint is so difficult that various men trying to reach the solution from the standpoint of their particular problem have arrived at different conclusions; that
as to say, two men looking at the problem would decide differently as to just how far the academic was applicable to their particular situation, and in consequence they would devise methods of solving it that would differ.

The New York Milk Committee last year concluded, or rather considered, taking up two problems. One problem was the question of the relative food value of the raw and cooked milk. This is a problem that was passed on by the American Pediatric Society about ten years ago as the result of very little investigation, as the result of very little preliminary study. Great diversity of opinion has prevailed since that time as to the relative nutritive power of raw and cooked milk, recognizing several variations in the cooking of milk.

As the subject was investigated the conclusion was arrived at that there were no data in existence on which a comprehensive study could be made, and from which conclusive or determining conclusions could be drawn. They decided that nothing would be gained unless the study was carefully made, and that it was broad enough to give information that would at once be determinative and would be voluminous enough to do away with individual variations. After canvassing the field pretty thoroughly they came to the conclusion that more money would be required for this study than they had at their disposal, and in consequence that was put aside.

They decided that there was a great need for standardizing ordinances and laws, and agreed that methods of administrative procedure should be carefully considered by a group of men, and that the results of their deliberations should be put out as carrying with them the weight that is normally attached to the signatures of the men who are to sign their report, the weight that would normally attach to a document that was issued by the New York Milk Committee and the weight that would properly attach to a conclusion that had been given as the result of the study made by that Commission.

In the first place, it was necessary to determine the personnel of that Commission. It was thought desirable that that Commission should have on it laboratory men, that it should have on it men who were in touch with the milk situation from the administrative side; that there should be men on that Commission that were administering milk ordinances in small as well as in large communities, and
who had to do with milk problems from the standpoint of the national and the state governments as well.

Here, too, we have this matter of the possibility of adopting the academic to the real coming into the field. There is a difference in the degree to which the academic can be applied to existing conditions, dependent upon the size of the city; dependent upon the distance the milk supply is removed from the consumer; that all of these things are things that need to be taken into consideration. It was also thought advisable to have men from different parts of the country, as the different parts of the country are in differing degrees ready for the measures necessary for the control of the milk supply, and so there were men from different parts of the United States who were chosen to sit on this Commission.

I am going into this somewhat in detail, because that Commission was chosen practically a year ago and they have held two meetings. They are holding committee conferences between times, and in January what it is thought will be the concluding meeting will be held, and the results of those deliberations will be issued, we trust, by the national government, and certainly they will be ready for broad distribution probably in the month of February. Those conclusions will represent the views of the men whose names are signed to the document, and I hope that the sending out of this document will do a good deal towards solving these problems. We have a lot of men bringing to that subject divers points of view at the present time. We have the men who have had to try to solve the problem of milk as it is, who have had to recognize the fact that a large number of people are actually dying—not theoretically dying, but are actually dying as the result of bad milk; that as a general proposition these deaths have been in the poorer parts of towns and among the children of the poor, and that in consequence it was necessary to find a solution that would be the solution that would be applicable to the place where a solution was needed; that is to say, that would be applicable to the milk that was sold in the poorer parts of the towns, to the poorer people of the community, that was consumed by the poorer people.

In my judgment the sale of certified milk should be encouraged just as much as it can possibly be encouraged. I trust that you will carefully note the precedent that has been set by the Detroit Department of Health. The Detroit Department of Health has undertaken the certifying of milk as one of the government activities. There is much that is to be said in favor of this and there is much
to be said against it. In the first place, this milk is a high priced milk and practically all of it where it is purchased by the consumer goes to the better to do people. To properly control this milk requires a good deal of the effort of bacteriologists and inspectors. It requires a good deal more of the effort of bacteriologists and inspectors than the commercial milk at present receives.

The argument against having this done by the city is this: No city is equipped with inspectors enough to properly safeguard its milk supply. I have never talked with a health officer who could see any time in the near future when cities were to be equipped with enough inspectors to properly safeguard the milk supply. I remember being in New York, I think two years ago, when they proposed jumping the number of their inspectors in the field or in the country from some twenty or thirty up to several hundred, and that did not get anywhere at all with the finance committee engaged in the making of the budget. I don't know where there is a health department that can see the possibility of getting a control of milk such as the national government now has over more than fifty per cent of the meat that is produced in this country.

Of course, we all know that milk is infinitely more important than meat; that a few people perhaps each year are killed by bad meat, but that a good many thousands each year are killed by bad milk, and perhaps some day a way will be found to have the government compelling control of the milk supply as it now compellingly controls more than half of the meat supply.

The objection is largely a theoretical objection. Perhaps the time was when milk was not a matter of interstate commerce, but a large percentage of the milk at the present time is a matter of interstate commerce in practically every American city. In New York City I think that more than half of it is a matter of interstate commerce. Milk is coming across the state lines into Chicago in larger proportions every year, so it would seem that it would be relatively easy to find a way along interstate commerce lines for governmental control of a milk supply, and perhaps there is a better way than that.

I heard Mr. Taft say out at Kansas City that they had found a clause in the Constitution that had made government worth while. It is what they call the welfare clause; that is, that the government has the right to do for the people anything that is for the welfare of the people, which, being left to the states or to cities, is not being done; that the government has the right to take it up under that
welfare clause. It is under that clause that the Agricultural Department has operated in most of its activities, and it would not stretch the Constitution beyond human recognition to apply it to this milk problem.

As I said a moment ago that no health department has enough inspectors, therefore, they should watch the low places rather than the high places.

There is something in the idea that has been advocated by Dr. Vanderslice, namely, that by encouraging high grade farms in a certain vicinity and high grade equipment in a certain vicinity, that you are doing something towards bringing up the general quality of the milk supply. On the other hand, certified milk does not need the same degree of watching that is required for ordinary milk.

A while ago I went up to Homer, N. Y., and spent a day with Mr. Francesco, proprietor of the Fairfield farm, perhaps the most noted and most successful certified milk farm in this country. I went up there with Mr. Francesco, with Dr. North and with Prof. Rosenow of Harvard, and we spent a day in looking over that plant. Their central idea is that concentration should be had on method rather than equipment. I saw people making milk there who had no milk house at all. I saw a man who was producing milk who was keeping his milk in a water trough without any cover over it; that is, there was no shed over the water trough, and I saw another man who was making milk and keeping it in a milk house made out of twelve-inch boards, Shanghai construction. No money at all had been spent by several of these men in equipment. All of the stress was put on two things—first, tuberculin testing, and second, cleanly methods of milk production.

The man that was producing milk and keeping it in a water trough was delivering milk at the factory every day with less than 2,000 bacteria to the c. c., and the same was true of the man who had the Shanghai twelve-inch board temporary milk house.

The things demanded are that the utensils shall be clean, that the hands shall be clean and that the udder shall be clean. That is about all that they have anything to say about. In order that the utensils should be kept clean, they look after the cleaning themselves; that is to say, the factories sterilize everything that comes in contact with the milk except the hands of the milkers and the udders, and they would like to sterilize those if there were any practical way whatever of doing it.
They give the farmer a bonus for milk providing it keeps under five thousand. If it does not keep under five thousand he gets no bonus. In addition, the man that delivers milk with the lowest count during the month gets a prize at the end of the month; that is, the man that has the cleanest milk every month gets a prize in addition to the bonus. They are having a lot of milk delivered there with less than 500, a good deal with less than 1,000, and they get no bonus unless they keep under 5,000. It is delivered in the City of New York under ten thousand, and it sells at about twice the market price for milk.

Another thing that I would like to bring to your attention is the effort that has been made during the last year to pasteurize milk as they pasteurize beer; that is, in the sealed bottle and sending it out under seal without having had the stopper of the container removed.

There are, I think, one or two places in this country where pasteurizing in the bottle is done by hermetically sealing the bottle and passing it through hot water and holding it there long enough to bring the milk to the pasteurizing temperature and then holding it at that pasteurizing temperature for twenty minutes.

And then another thing, perhaps the last thing I have to say, is to advocate before you as I think I have before, and as I have on a great many occasions, bringing of the cows back into town. I can see no possibility of getting raw milk for the average people of the community, to say nothing of the poorer people of the community, in a condition that is proper for use save that of getting the cow back in contact with the baby. What I am now saying relates particularly to the feeding of babies and does not particularly apply to the general milk supply.

There is nothing that quite takes the place of freshness, and I do not believe that milk produced twelve hours away—for I think this thing should always be figured in hours—could never be as good as milk which is even average well cared for and is but two hours away from the baby. Milk that is forty-eight hours away can never be as good as the milk that gets to the baby within four hours after it has left the cow; and I hope that you gentlemen will give serious consideration towards this proposition of getting the cows back into town, insofar as it is necessary that it be done to furnish milk for the baby.
The President: Dr. Evans, I am sure we are very grateful to you for the way you have presented this question.

We have with us another gentleman who has had much experience from many viewpoints of this milk question and who is greatly interested in it, Prof. Pearson of New York, who will speak to us on this subject.

Prof. Pearson: Mr. President and gentlemen: It occurs to me that there are four things necessary for the production of a good milk supply—materials, methods, men and money. We are further along on the materials and methods propositions than the other two propositions. We have heard splendid papers, but each speaker stopped short of covering the method of milk production. Dr. Whitaker has gone through the list in good style and he has told us a great many things which he has preached for the last dozen or fifteen years to my knowledge. Other men have been preaching many of those same ideas for many years.

Some years ago I recall that the United States Government made an effort to introduce good butter in Porto Rico. Samples of the best butter that could be made were sent down there, and it was offered to some well to do people in Porto Rico, asking them to try it on their table, so as to hear what they thought of it in comparison with the absolutely rotten stuff that they make down there. And yet a good many people preferred that to the better butter. Some of them put up their noses and said: "No, we don't want that kind of butter; it has not got taste enough for us." It is an actual fact that there are some people who prefer to be dirty than to be clean. Now, we ought to be able to eliminate that. I like the idea of licensing. I think we ought to have as few regulations as possible, but I would like to see clean, decent, well informed, well meaning men who are engaged in the milk business licensed, and I would like to see some of the others cut out, and that is a hard proposition.

It occurs to me that we should make some allowance for the present conditions and yet carry forward our educational work, for it is largely a matter of education, and there is some reason for the slovenly methods that prevail throughout the country. Perhaps this is due to the fact that milk has been sold at such a low price all through these recent years.

Let me illustrate that by another product that I happen to have in mind. Ten or fifteen years ago oats were sold from our farms for
sixteen and one-half cents a bushel, according to the report of the National Department of Agriculture, and every bushel took away from the farm about ten cents worth of fertility, and milk has been sold in our states year after year during the flush season for a cent and a quarter or a cent and a half a quart, and consequently took away an enormous amount of fertility from our farms, and how could you expect those people to do their work well when they were getting such losing prices as that? And so I say that money is a matter of importance to this consideration. We ought to do what we can to pay the men who produce good milk for their extra quality, and I always like to emphasize that point.

There is as much difference between the different grades of milk as there is between calico and silk, but if you are going to sell it all for calico prices we are all going to buy calico, because the manufacturers will give us the cheap grade every time.

Dr. Evans has referred to the splendid work being done at Homer in our state. Now, gentlemen, let me tell you how that came about. A few men just like you got together and made up their minds that they would pay a little more for quality, and they passed the word on to their friends and others who would be guided by them in paying the additional price to cover that quality, and Dr. Evans knows that at Homer, N. Y., where they pay a cent a quart extra to the farmers who produce milk with a low bacterial count, they are able to procure all that they need to meet their demands and more than that.

I like to bring things home. I think we are a little too much inclined to give these educational talks and then drop the matter. I was told the other day that our largest New York milk company has at last taken one step in advance, and that is the use of the small topped milk pail. Now, I wish I had just one dollar for every time I have mentioned that in talks throughout New York and other states. I would have quite a large sum of money, and now at last we are beginning to get results. This company took advantage of it, and they have ordered I understand ten thousand of those pails to be distributed among the farmers, and I say to you gentlemen that I think we ought to advocate a fair living price for a fair quality of milk, and I believe we will find that the farmers are more ready to produce that milk than the consumers are to pay for it, and I think that is a condition we should try to correct.

I referred to men, and I would like to make my application
extend to the inspectors. The inspectors are a force under this problem which is doing a great deal of good in some sections and not so much in others. There is a tremendous difference in inspectors. I realize it is impossible to secure such high qualifications all at once, but I wish that this Association might have a paper and discussion on that subject and have it referred to a committee to summarize it, so that boards of health, civil service commissions and departments of agriculture and others who are employing these inspectors may have some facts relative to necessary qualifications, and in that way we may be able to get a much higher type of men and greater uniformity in our work.

ADJOURNED TO 2 O'CLOCK P. M.
AFTERNOON SESSION.

December 6, 1911.

Meeting called to order at 2:30 o'clock p. m. by Mr. Fred F. Walker.

The first on the program this afternoon is Dr. K. F. Meyer of Pennsylvania.

Note—Dr. Meyer gave a very interesting resume of his investigations in connection with Texas fever which the sentogapher failed to record.

Chairman Walker: Next in order we have a paper by W. N. Waddell of Texas.

TEXAS FOR ERADICATION IN TEXAS.

By W. N. Waddell.

Mr. President and Gentlemen:

I cannot say as much as I would like to say in behalf of the great State of Texas. While we have made some very creditable showings in our tick eradication work, yet we have been handicapped by having to come in contact with those opposed to the enforcement of the regulations on a general principle.

My records show that we have released from quarantine within the last eight months about 150 different premises. On those premises are ranging about 45,000 to 50,000 cattle. In proportion to the amount of infected country in Texas, this is a very small showing, but as in every undertaking there has got to be a beginning, and when I remind you of the fact that Texas has an area of approximately 500 miles one way and over 600 miles the other that is infected with ticks, and that has been infected ever since it
has been settled, I am myself amazed at the stupendous proposition of undertaking to eradicate the ticks off that great area.

As has been very properly said in the papers read at the meeting yesterday, as well as in those preceding me today, the successful execution of any extended degree of tick eradication in Texas has got to be preceded by a system of education. Our people have got to be taught the importance of filling their ranches with disinfected cattle and they have got to be shown that the annual growth of their cattle is retarded by reason of tick infection and they have got to be taught that a clean herd of cattle in uninfected territory is, worth from $2 to $5 per head more in the markets of the world than cattle of the same grade off the territory infected with ticks.

How humiliating it was for me when I had to sit here yesterday and listen to the paper read by our worthy President. To hear him dub the State of Texas by calling Spenic Fever or Tick Fever TEXAS FEVER. It seems unfair to me, gentlemen of the convention, that Texas should have to bear the stigma of having the dreaded tick fever carry its name—for, as you all know, there has existed more or less I am sorry to say, prejudice against Texas and against Texas cattle especially, yet we have in Texas a greater area above the line than is embodied in any other state east of the Mississippi River.

The educating of our people up to the necessity of tick eradication work has been inaugurated by the present Sanitary Board of Texas in co-operation with the Bureau of Animal Industry, through its representative, Dr. L. J. Allen of Oklahoma City, and his corps of inspectors. This new Sanitary Board of the State of Texas has inaugurated and put in practice methods of handling cattle heretofore unthought of in our state for the education of the farmer and the small stock man. I have inaugurated a system of spraying. The State of Texas furnishing this spraying machine and the dip necessary to spray cattle with, without expense to the little farmer or the small stock man. This I have done in communities where it was impracticable to build a dipping vat. This system of spraying of the farmer's cattle and without expense to the farmer I am proud to say to you is creating a tie of friendship between the farmers and Live Stock Sanitary Commission of Texas which has never existed before.

The legislature was kind enough last session to increase the appropriation for the use of the Sanitary Board of Texas from $15,000 to $35,000 per year. With this increased appropriation, I have been enabled to inaugurate this spraying work among the small cattlemen and farmers of the country, apprehending in the near future to go before the legislature and ask them to pass a law giving the county commissioners of the different counties of our state the right to appropriate money out of the general funds of the county to aid in the work of tick eradication; knowing as you all do that in order for the county commissioners to make an appropriation an election must be held authorizing that appropriation, I conceived the idea by disinfecting the small farmer's cattle, killing the ticks off, they would be encouraged to support in the election an appropriation to aid in the work by the counties. The matter of educating the larger ranch owner, the man with cattle sufficient to have his dipping vat, the man who makes the stock business his main business, I can think of no other method or no other way to educate him except by disseminating the news among them which is a
fact, that cattle above the quarantining line that are free from infection are worth from $2 to $5 a head more than cattle below the line.

I am proud to say to you that the effect of this information is bringing a great number of cattlemen of Texas to see the necessity of tick eradication. In fact, gentlemen, the importance of the undertaking is just now beginning to be appreciated by the officials of our state, those clothed with the authority to make provision for the proper prosecution of the work. I am proud to say to you that with the aid of Dr. L. J. Allen I have, you might say, conducted a system of education among our people, from the governor and members of the legislature down to the little one-horse farmer, during this year, that has made today evidences discernible all over our state of the gradual disappearance of opposition. When I assumed the mantle of Chairman of the Live Stock Sanitary Commission of Texas, I began looking around for a starting point whereby to begin my official career; the first and most important feature of the work that occurred to me was to establish cordial relations with the Federal Government, get the confidence and goodwill and cooperation of the employees of the Bureau of Animal Industry, realizing that the Federal and state work was identical, the object being to attain the eradication of the tick. How well I have succeeded in that part of the work I will leave for the Federal people to say.

In conclusion I wish to assure this Convention that nothing short of an adverse result in the election in our state, which will be pulled off next July, can slow down the work of tick eradication in Texas, which we have inaugurated, and which will go peacefully on unless, as I say, the enemies of good government should be successful in the election and place at the helm of the ship of state a coterie of officials whose only ambition and only thought is to make something dry, for with all the money at the command of the Federal Government, with all the myriads of men working in experiments for the Federal Government, there has never yet been discovered a dry process for tick eradication.

The President: This question will be discussed by Dr. E. M. Nighbert.

THE CATTLE FEVER TICK PROPOSITION.


In summing up the Texas Fever proposition scientifically, there is nothing particularly new to add to what has already been said and written. Of course, the recent further study of the disease and its medical treatment and the further study of the biology of the tick, is interesting and important. This study has brought up practical suggestions and facts of much value.

It seems to me what the public should know now are the concrete practical facts in dealing with this proposition, which is of extreme importance to the cattle industry of the nation. This cattle fever tick trouble is no longer a southern problem; it is a national proposition, because the hue and cry today is shortage of cattle to supply everyday needs. It is national because last year great numbers of cattle were imported from foreign countries because of real necessity. It is national because cattle are the very foundation of the great agricultural movement in land fertility conservation. While this point is a great national problem, I want to emphasize the point that it is not my intention to impress you that it is the Government's duty to go on
the farm and do this work for the people. It is the people's duty to do something for themselves. The position of the Government, as an advisor and director of the work along educational lines in the way of literature, actual demonstration and strict enforcement of law governing interstate movements of cattle, has proven to be quite right and successful results have followed.

Conditions are so markedly changed throughout the country that it is a problem to induce the agriculturalists to continue the production of enough cattle to supply beefsteak for all. There is no denying the fact, that unless conditions soon change, beefsteak will be a luxury.

The old easy methods of breeding, grazing, feeding and fattening have changed now, until it has become almost an art to make profits out of the business under the present conditions. These changed conditions may be explained in short by the high price of land and reduced grazing areas. The many other points are quite well understood.

It is a well known fact and completely established, that this blot to the cattle industry, namely: the cattle fever tick, of this country, may be successfully removed, thereby opening up a free and unrestricted cattle traffic between all the states and large grazing areas in the southern section of the country. By the removal of this menace to the cattle industry of this nation, large areas now without cattle may be utilized. Unless this proposition is seriously considered by men interested in the great conservation movement, the very foundation principle is lost. It is well known that as soon as cattle and other live stock occupy the land, the soil begins to improve.

The plans and methods of complete tick eradications have been worked out and actively applied since about 1896 and have proven a complete success. Of the fourteen states affected with tick fever infection, every one has confirmed the plan by practical demonstration since that date. Since the general active campaign throughout the country inaugurated in the summer of 1906, there has been an area of one hundred and forty thousand square miles of territory freed of ticks up to date. Infection remains in an area of seven hundred and sixty seven thousand, one hundred and thirty square miles. At the rate of progress so far maintained, twenty-six years will be required to free the entire area.

Since locating the infected area and establishing the national quarantine line in 1885, proved conclusively that the spread of this disease can be completely controlled and confined to infected states. The establishment and maintaining of this line was a mighty factor in attracting public attention to this serious problem. In studying the problem it is a wonder that the people of this great southern country should have tolerated this handicap for twenty-six long years.

Let us study for a moment just what this quarantine line meant, both to the states affected and the country at large. Thirty years ago thousands of southern cattle moved northward to eat the cheap corn and grass, simply as a necessity to the north and middle west farmer; he realized not so much profit at the time, but knew that cattle raised and fed on the farm always improved the soil. The establishment of the quarantine stopped this movement, except during the first few months of winter. This as is plain to be seen, gave the cattle business of the south a black eye. Nothing is so alarming to the cattle raiser and feeder as to know
that stock from a certain section is diseased and dangerous. The establish-
ment of this quarantine line which branded southern cattle dangerous, did
not seem to worry the southern farmer very much, especially in the section
east of the Mississippi River. The land owners and farmers of this section
soon realized changed condition in their staple crop in the way of better
prices and were reticent on the subject. The indifference did not affect all
men alike, some men liked the cattle business and had made great efforts to
establish good herds, but met failure, attributing their losses to the climate,
feed or faulty handling. These men were naturally live stock men, but were
soon convinced that whatever was the cause of that quarantine handicap,
had something to do with developing cattle at home safely and profitably.

The tick, so familiar to all cattlemen of the south, was charged with
the whole trouble, thus producing disease in every calf that was dropped in
the presence of the tick. This calf did not die perhaps, but was stunted in
growth and carried the disease germs in its system throughout life. The
young calf was found to have a tolerance for the disease that grown animals
did not have, if the grown animal had been raised where there were no ticks.
This was a very important point, it really prevented the introduction of well-
bred cattle from above the line to improve home herds, when such cattle were
imported and come in contact with ticks, they would sicken and oftentimes
die, they soon became unthrifty and a disappointment to the owner. This
condition, as you plainly see, caused a loss of millions in the intrinsic valu-
tion of cattle, besides millions in loss by death and exposure and the value
of having cattle on the farm for land improvement.

These losses were tremendous and will continue under quarantine re-
strictions, because the market price for all cattle below the line is fixed at a
lower rate, no matter what the quality, and this fixed price, prevails right
at the home market of the south, even if the cattle compare favorably in
quality with cattle on the market above the line. Think of it, good cattle
selling lower than the same cattle in the best markets of the country, all
on account of the cattle tick quarantine. This condition will never be re-
lieved until the ticks have been eradicated.

Cattle of the quarantine area, when sold either at home or on the big
markets, are sold as "Southern" or "Quarantined Cattle," and the price is
fixed lower, because the cattle must be sold for immediate slaughter, or
held and treated under rigid restrictions, which adds expense. The home
buyer knows these points and takes advantage of them when good cattle
are presented for sale at home in the quarantined area.

This feature of the business discourages the winter feeder, because of
late years the farmers of the south are seeing the importance of feeding
cattle from ninety to one hundred and twenty days, for the manure pro-
duced. The Southern farmer and cattle feeder, especially in the Gulf and
South Atlantic States, in order to get a good grade of cattle that may be
fed profitably, must go above the line to get them, then he pays above the
line price,—he is knifed from two sides. The seller has the advantage above
the line, he can ship his feeders anywhere to the best markets or sell to a
good advantage at home, so he does not care for the southern feeder's busi-
ness. The feeders in the quarantined area are stung by paying a long price
and selling on a short one. Remember now, it makes no difference how good
southern cattle may be, so long as the tick is present and the quarantine is
on, they will sell for a lower figure. The market loss amounts to millions of
dollars annually, because the difference in price of quarantined cattle and cattle above the line, is always from one-fourth to one and a half cents per pound in favor of the cattle above the line.

It seems a pity that the great southern country will not grasp this situation, study and understand these points, in order that the work of tick eradication may be completely ended in the shortest time possible.

It is a fact that if the cattle fever tick was eradicated, and the cattle industry gradually established, the farmer need have no fear of cotton plant diseases or the boll-weevil, because the best known plans to check these invaders are to rotate the crops, enrich the land by manure, which would make the cotton plant mature early, rapidly and thriftily.

The great body of business men, land owners and farmers have the last two or three years began to get a hazy conception of what this cattle tick proposition means to them, and when they once clearly see the great importance of removing this agricultural handicap, it will be done and not until then.

There is no wide difference as to procedure in any state in the work of eradicating the tick. Local conditions, of course, vary greatly and must be worked out by the men on the ground, but to succeed the well established and tried out plan of either abandoning pastures or dipping or disinfecting animals in some manner must prevail.

To look twenty-six years in the future for completing this work is not discouraging, because there is every reason to believe the work will be completed long before that time. The people of the cotton area are slowly beginning to realize the long established rule of the success of one crop is being threatened by the invasion of cotton plant diseases and insect infestation, which cannot be checked except by change of plans in farming. The idea now in the minds of the people and advocated by the statesmen and men of position is to make cotton the standard surplus money crop and utilize surplus land for the production of crops and animals for every day home use.

In studying the subject of tick eradication and what it means to the affected states and the nation, it is interesting to note how far-reaching and what it means to the people. The extension of this work will continue just as rapidly as the people will let it. They must accept the facts and believe them.

Authentic records reveal the remarkable fact that the average production of lint cotton per acre throughout the cotton area is one hundred and sixty-nine pounds. The seriousness of this condition is that this yield has not materially increased during the last forty years. This shows that something must be wrong either with methods or soil. This yield, remember, is produced by the annual use of about $150,000,000 worth of commercial fertilizer. It is important, too, to remember that the use of commercial fertilizer, which began in the early fifties, produced no material increase per acre of any of the crops, except during the last four or five years, when methods began to somewhat change. It has been conclusively shown that the cotton states spend annually $200,000,000 more than the crop brings for the necessities of life, which are produced elsewhere. This condition, you see, is bound to encourage the work of tick eradication and the gradual
establishment of a cattle industry.

There are many factors forcing these problems to realization, the Corn Clubs organized throughout the southern states under the direction of the government and state official, increased the average yield of corn per acre on the farm where the plans were executed over fifty per cent, and right here is where I wield my tick eradication club. Every acre of this corn club yield was heavily fertilized with barnyard manure; otherwise the remarkably large yield could not have been made. I mention these facts because they are closely allied with the general movement on the tick proposition.

It is time now to be serious and acknowledge facts and conditions as they really are, because if the facts are not known or realized progress will be slow. In summarizing this whole proposition the point must not be overlooked that the soils of the cotton states are generally poor and always have been; natural conditions make it so. The long, mild climate, topographical conditions and abundant rainfall favors leaching and erosion, even the virgin soil lacks the necessary elements to produce well.

These points are not brought out to lower the high estimation generally maintained by the people of the southern country, but to show how important and how timely it is to begin to put out cover crops and encourage the establishment of pastures and a cattle industry.

It must not be understood that these changes will be easy. It must not be understood that the establishment of a cattle industry in any section of the country is an easy matter, because it is too well known that under the most favorable conditions and with the best efforts put forth, high standards in anything are hard to maintain.

Those of us with experience connected with the execution of the work of tick eradication see many things that would in our opinion facilitate matters. In the first place, suitable laws are essential—laws that are not questioned as to their state or federal constitutionality. At present some of the state laws and the federal law governing this subject are questioned in some quarters. This, as you see, is a serious hindrance. It makes men of high position view the enforcement of a cattle quarantinc law lightly. In the second place, the preliminary work in each state should cover a large area with a view of launching a state wide campaign, if conditions favored it. This would not take any more time or money in the long run and give the business a standing and recognition of its importance to the whole people of a state.

The extermination of this disease agent is unlike any other live stock sanitary problem that has confronted the federal or state governments. It cannot be handled along the line and in the same manner and methods adopted in eradicating other serious cattle plagues that have appeared and been stamped out of the United States.

The peculiarity of the mode of transmission from animal to animal and the conditions prevailing under which the cattle industry exists in the infected area naturally makes the problem a great undertaking.

The eradication of the cattle fever tick from the southern country is the greatest work and is the most far-reaching ever undertaken for an agri-
cultural people in all the annals of time. If anyone does not believe in this work, or that it cannot be done, it is because he has failed to keep step with scientific progress and the fixed and definite plans back of the movement. This great work is now so deeply rooted that failure is not considered. This work is a success and will continue to succeed until completed. It started with the cattle owner on the farm; he was shown what an easy problem it was and that within the short period of from four and a half to nine months that his cattle and premises could be made free. Counties started and freed themselves, the state started and the nation started to push this work to completion.

The cattle tick is an obligatory parasite and depends on cattle for its life and propagation. If it fails to get on cattle, horses or mules it dies from starvation. If it is destroyed on the bodies of animals by the use of parasiticides it dies for the want of a chance to reproduce itself.

It is time now to quit dilly-dallying on the proposition of complete tick eradication. Arguments as to its feasibility are out of order. It is time the various states interested should come forward with new vigor and demand suitable laws and appropriations, in order that thorough co-operation may be secured and established. With the knowledge, with the success in the work so far achieved at the enormous expense and time consumed, the easy movement of cattle exposed to or infested with the fever tick, should no longer be tolerated. Stop the movement of ticky cattle on the public highway, by rail or boat, and a greater responsibility would be placed on the owners of such animals. The eradication would be automatic and far in advance of the actual farm to farm work which is now in progress throughout the country.

The early introduction of inferior cattle in the southern country and the existence and spread of the common cattle tick so familiar to all, makes the movement of eradication a general farm improvement proposition. It does not matter how much time or money may be necessary, every dollar will be returned value received to the entire nation.

Dr. Kiernan: Mr. President, in this matter of tick eradication I believe it is time to take advanced steps, and I have here a little suggestion that occurred to me.

Section 6 of the Act of Congress approved May 29, 1884, entitled "An Act for the Establishment of a Bureau on Animal Industry," provides that no railroad, etc., shall receive for transportation, interstate, any live stock affected with any contagious, infectious, or communicable disease: Provided, That the so-called splenetic, or Texas fever, shall not be considered a contagious, infectious or communicable disease, as to cattle being transported by rail to market for slaughter.

It is clearly manifest that the notorious disease has not succumbed to legislative action. The provision made in 1884 was necessary, as there was no known method or even expectation of
handling the tick other than by holding it in check to prevent its further encroachment. At that time and up to the period when it was found that the eradication of the tick was possible, the movement of cattle from the quarantine area to free territory for immediate slaughter was entirely justifiable, but to continue the practice beyond this time is temporizing and tolerating a public nuisance that verges on a national disgrace. The tick can and must be eradicated and the good people shouldn't be entirely allowed to determine when they shall make up their minds to do it. Ten years is a long period to the progressive workers of this age. De Lesseps worked ten years and spent two hundred and sixty millions in an attempt to cut through Culebra and dam the charges at Gatun, but he failed. It was left to our United States of America to accomplish this world famed work, and it will have been completed within a decade from the time the first shovel was sunk into its back. It took seven years to clean up the ticks in the first counties, but this year a county was freed in six months by the use of arsenical solution in 180 dipping vats, and we will not be satisfied with less satisfactory and speedy results. We are going to eradicate the cattle tick in ten years, but we want a clean break under modern rules.

The movement of tick infested animals interstate for any purpose should be prohibited immediately by an act of Congress. It matters not whether the animals are cattle, horses, mules or asses, none should be permitted to be shipped from any quarantined territory until they have been freed of ticks. I will not undertake to explain how such a radical rule could be expected to be observed. suffice it is to say the tick is the specific medium of transmitting the organism which is the cause of an infectious disease, fatal to cattle. It has cost this nation ten times more each year than the price of the Louisiana purchase. As long as the movement of diseased cattle is permitted by law just so long will some people put off doing their plain duty in assisting to wipe out this great evil.

We are creating a good deal of interest in our territory by the organization of tick eradication leagues. On October 27, at Jackson, Miss., we had a meeting held at the capitol and had a crowded house. If we had had accommodations for one hundred more people we would have had them, but they were unable to find seats.

We are trying to enlist the support of all thoroughbred cattle associations to help in our work, and we are asking them to offer prizes to the counties in which the best work of tick eradication is done each year, the prizes to be bull calves to be sent into the county
where they have already prepared for taking care of them by having a cattle organization, and I would like to see this Association lend its support in a material way by agreeing to contribute a bull calf to one county in each of the states in which tick eradication is being conducted, the prize to be awarded to the county in which the best work is done every year.

In our work we encounter a great deal of difficulty in eradicating cattle ticks, because we are dealing to a large extent with people who are not interested in live stock, people who have been engaged in the raising of cotton for a great many years and have overlooked or have never had an opportunity of getting into the live stock business and creating an interest in it, and as was stated by two or three speakers yesterday, our great hope is in instilling an interest in the growing generation, rather than those of mature age.

The President: Does anyone else wish to discuss this question?

Dr. Bahnsen: Mr. President, there has been a reference to the immunization of cattle against Texas fever; that is, for shipping cattle into the tick infested territory. Personally I believe that it is a partial failure, and a considerable drawback to the work of tick eradication, as every man of practical experience knows that you cannot immunize cattle and then turn them loose on infected premises and get good results. You have got to keep the tick off in order to preserve the animal's health. Immunized cattle makes the owner more or less indifferent so far as keeping the ticks off, and I believe it is a drawback to our work.

Dr. McKellar: Mr. President, the matter of shipping tick infested cattle in California was one great drawback at the beginning of the work. The State Legislature took it up and passed a law prohibiting the shipment of any infested cattle, unless they were loaded directly from their premises to the car. That in a large measure did away with that drawback and was very effective in stopping the reinfection.

California is getting to a stage that they can see the end, and the co-operation and education of the people has been the principle factor in bringing about that result.

The President: Gentlemen, the next paper to be read is:
INFECTIOUS ABORTION IN COWS AND MARES.

By E. S. Good, Kentucky Agricultural Experiment Station.

There is a forceful statement made by ex-President Draper of the University of Illinois that the resources of our country lie in her soil and her wealth in its intelligent development. I need not add before this audience that the intelligent development of the soil includes the breeding and feeding of live stock and that the greatest drawback in the raising of live stock is the different contagious diseases to which our domestic animals are subject. The farmer who has spent years of thought and labor, as well as a great deal of money, in building up his pure bred and grade herds, flocks or studs, to see them either depreciated in value or totally destroyed by some contagious disease is an only too familiar figure and one which arouses our sincerest sympathy.

Tuberculosis and infectious abortion are two diseases causing a tremendous loss annually to the breeders of beef and dairy animals not only in this country but in foreign countries as well. In fact, I believe that abortion is becoming as much a nightmare to our dairymen as is tuberculosis. The loss in the United States yearly amounts to many millions of dollars. To lose a calf in most grade herds does not mean as much to the dairymen as the loss occasioned from the decreased milk flow of a cow which aborts, as compared with a year in which she delivers a normal calf. Also, cows that abort conceive with difficulty, and at times not at all.

There is no doubt that there is such a thing as infectious abortion among our domestic animals for it has been recognized for many years not only among the stockmen themselves, but by veterinarians in many parts of the world. Abortion, long ago, was experimentally produced by inoculating some of the uterine exudate from an aborting animal intravaginally in pregnant animals of the same species. It is reported on reliable authority that Franck, Braurer, Galtier, Nocard and other European workers carried on affirmative experimental work along this line.

In 1886 Nocard carried out the first extensive investigation of a bacteriological nature with reference to this disease. He recognized a short bacillus and a micrococcus as being the most often associated with the foetal membranes of an aborting animal. He was unable, however, to produce abortion experimentally with pure cultures of these organisms.

Ostertag of Germany has been one of the most prominent workers of this disease among mares. He found in the heart blood of the foetus, in the thoracic cavity and in the intestinal tract, short streptococci which usually grew in pairs and readily stained by Gram's method. He was able to produce abortion experimentally by injecting a culture of this germ into the jugular vein of mares. Considering the fact that Ostertag was able to secure the organism from the foetus and produce abortion experimentally with this organism, leads me to believe that he secured the germ that was causing the disease among the mares of his special district at least.

Law and Moore of Cornell and Chester of Delaware have found a type of the colon bacillus associated with the foetal membranes of aborting cows.
In 1887 Bang and Stribolt of the Royal Veterinary College of Copenhagen, Denmark, announced that they had discovered a germ associated with infectious abortion in cows that was able to produce the disease when inoculated intravaginally, or intravenously, into pregnant cows. The bacillus was described as a very small organism that resembled under the low power of the microscope cocci, but under a high power they found that they were thick bacilli containing one, two and three granules. After repeated efforts these gentlemen were able to cultivate this organism in serum-gelatinagar, the germ developing in a particular zone of the medium, beginning about 5 mm. beneath the surface of the medium and extending downward 10 to 15 mm.

Dr. Charles E. Marshall of the Michigan Experiment Station was the first man in this country to give a short review (Special bulletin 13, Michigan Experiment Station) of Professor Bang's early work, and it was largely through the inspiration obtained from reading this publication that the writer began his bacteriological investigations of this disease in live stock at the Kentucky Agricultural Experiment Station in 1907. Owing to the ravages infectious abortion has made among the thoroughbred and standardbred mares of the Blue Grass region, I at first directed my attention to the isolation of the germ causing the trouble among them. As there was a nearby herd of cows apparently affected with the disease, we turned our attention to the disease in the cow as well as in the horse. We soon found a great many difficulties involved in the work. In the first place, it is impossible to tell the exact time when an animal will abort and as the foetal membranes become contaminated with many species of bacteria in a short time after expulsion, it is quite difficult to secure fresh uncontaminated specimens for the laboratory. This is especially true during the warm summer months. To isolate the different species of bacteria that one would think might have some bearing on the problem and to make a study of their physiological properties and carry on inoculation experiments on small animals with the same is an endless task, and it would be useless and burdensome to detail this work before this gathering. During our early work, however, we secured a specimen that led us to believe that a small diplococcus might have something to do with the disease in the cow. The afterbirth of an aborting cow was secured on which little whitish nodules were seen, ranging in size from No. 6 shot to a small pea. Some were nearly round, while others were irregular in shape. Upon staining one of these nodules it was found to be crowded with a small diplococcus. The germ grew readily in serum-agar, although it increased in size from the original culture. Tubes containing cultures of this organism were accidentally thrown away. Two pregnant guinea pigs, however, had been inoculated, one intraperitoneally and the other intravaginally, with pure cultures of the germ. Four days afterwards the pig inoculated intravaginally gave birth to four dead pigs. The germ was not isolated from the uterus. The other pig carried her pigs full time and delivered them alive. I have never observed an organism since connected with abortion that exactly tallied with this one. In one instance we found the amniotic fluid and afterbirth of an aborting cow teeming with Staphylococcus pyogenes aureus in pure culture. In spite of skillful medical attention, this cow became very much emaciated and when it was evident that she would die she was killed and posted. The uterus and most of her internal organs were a mass of pus, the Staphylococcus Aureus being the cause. It is evident to me that this organism invaded the uterus and caused the expulsion of the foetus and would have
killed the cow. In all these operations we were continually on the outlook for the bacillus discovered by Bang, but during the first three years of our investigations I was unable to isolate it, and made the statement that I did not believe it was the cause of the disease in the herds we were examining.

During the latter part of 1910 we often ran across a diplococcus and occasionally a streptococcus connected with the uterine exudate of aborting cows as well as from the umbilical of the foetuses. The diplococcus resembled morphologically the diplococcus secured from the cow in 1907. We bent every effort to see if this organism was the only one connected with the foetal membranes and to that end used all possible precaution to secure the material free from outside contamination. On January 11, 1911, we were informed that a cow in one of the herds we were working with was giving symptoms of aborting. The same day this cow dropped a live weak calf, in the 250th day of gestation. She was taken to the open field for the removal of the afterbirth and as the ground was wet there was no dust flying to contaminate the material as it was taken from the cow and put in steril jars. The veterinarian washed his hands in soap and water, cleaned his finger nails and then washed his hands thoroughly in bichloride of mercury 1 to 500. In the meantime the cow was cleaned and washed from the hook points backward with a disinfectant. The first material taken from the cow was discarded, after which three or four cotyledons were placed in steril jars and from which streak dilutions were made on serum-agar. Pieces of compact pus were also taken from this cow. These dishes were incubated in a partial vacuum by extracting a part of the air with a vacuum pump. The writer had previously determined that one of the Novy jars slowly leaked air. For instance, if the vacuum measured 27 inches of mercury at the beginning it would at the end of six days measure 3 to 5 inches of mercury. The presumption was that if the Bang bacillus were present in any plating it would in this wide range of diminished atmospheric pressure find a definite pressure of oxygen in which it would grow. These plates were incubated for six days. Some of the serum used was contaminated, as was shown by controls. One dish, however, had but two organisms growing upon it, one the pearl colonies of the diplococcus on a limited area of the dish, and the other a scanty growth of the Abortus-bacillus, Bang, on a considerable portion of the dish. The growth might have escaped my attention had I not examined the dish by reflected light, for in such light there was a bluish color on certain parts of the dish. By examining the dish under the low power of the microscope I found that there was some growth which appeared like thin drops of water at the places where the bluish color was seen. I have since often noticed this same appearance where a scanty growth of this bacillus was growing on serum-agar. A stain revealed an organism that looked under the low power of the microscope like a coccus, but upon careful examination by higher magnification I found that it was on the whole a small bacillus varying in length and width, and taking the stain differently, for some appeared as diplococci; others took the stain the entire length of the bacillus; others appeared as short bacilli taking the bipolar stain; a few others were slightly bent, taking the stain at the ends and in the center leaving two unstained portions of the bacillus; while others took the stain the entire length and appeared wedge shaped. This variation of morphology is sufficient to puzzle any one in detecting this germ in the uterine exudate, providing he has never seen it and especially so if the exudate contains other varieties of bacilli and cocci together with a considerable
amount of granular material, as is usually obtained from the afterbirth of a cow that aborts. Just before finishing writing this paper the afterbirth and foetus of an aborting cow in a herd with which we had done no previous work was brought to the laboratory. The veterinarian said this was the first cow on the place to abort. The foetus was still warm when it reached the laboratory. Platings were at once made from the heart blood, liver, kidneys, spleen, omasum, reticulum, large and small intestines of foetus and cotyledons of the afterbirth. These plates were incubated aerobically for twenty-four hours in the air, at the end of which time there was no growth from platings of organs of foetus with the exception of now and then a contaminating colony. These plates were then incubated four days, Nowak method, at the end of which time all were negative with the exception of the plates from the omasum, reticulum and cotyledon of the placenta, which contained from 75 to 150 colonies resembling those of Abortusbacillus, Bang. In this instance the stain of these colonies showed short, thick bacilli taking the stain the entire length. Had I not considered the typical colonies found on these plates and the fact that this organism had been obtained from the stomach of a freshly aborted foetus, I would not have recognized this germ as the Abortusbacillus, Bang. By a magnification of 3,000 diameters with the apochromatic objective and compensating ocular, it could be seen that though these germs had taken the stain their entire length, some of them took the stain more deeply in places, thus showing the granules observed in other cultures. Submitting subcultures of this organism to the cultural characteristics of Abortusbacillus, Bang, it tallies identically with the Bang bacillus—especially in what I consider the deciding test of not growing in the air, but producing a nice growth in three days when grown the Nowak method. I have spoken perhaps more than I should have on the morphological and cultural characteristics of this organism, but I want to give the reasons as far as I am concerned in not having isolated it before I did. As far as I know no other germ possesses the peculiar physiological properties, especially as to its oxygen requirements, as does the Abortusbacillus, Bang.

Up to the present time we have isolated this germ from three herds. The one herd which I shall designate as No. 1 has had on the average thirty cows and heifers to freshen per year during the past ten years and during that time fifty-seven, or nineteen per cent, have aborted. Since securing my first culture of the Abortusbacillus, Bang, from herd No. 1 I have examined the uterine exudate of ten aborting cows from the herd and have been successful in getting a culture of the bacillus of Bang in three cases. During the same time I have examined eight foetuses in the same herd and have isolated the Abortusbacillus, Bang, from the internal organs in two cases. In one of these foetuses we obtained cultures from the liver, small intestines, kidney and stomach, and from the liver in the other one. In the first instance the foetus was dropped in the 189th day of gestation and in the other instance the premature delivery occurred on the 262nd day of gestation, and the calf lived three or four hours. On obtaining my first culture I made a trip to the Illinois Experiment Station to compare cultures with MacNeal and Kerr, whom I had learned had succeeded in isolating the Bang bacillus, and found the cultures to be identical. Dr. MacNeal was using the Nowak (Nowak of Austria) method of isolating the organism, which consist in streaking a piece of cotyledon or other material from an aborting cow over two or three petri dishes in succession, as is done in streak dilutions. The pressure of oxygen
is then lowered to the right degree for the Amortusbacillus to grow by means of the Bacillus Subtilis, allowing one square centimeter of surface culture of Subtilis to each fifteen cubic centimeters capacity of the sealed jar in which it is growing. We find the Novy jar for growing anaerobes admirably adapted for this work. For a considerable time before discovering the germ we endeavored to secure a culture of the bacillus, if present in the foetal membranes, by taking all and a part of the oxygen from sealed jars, through the agency of pyrogallic acid and caustic potash, but were unsuccessful. Since securing a pure culture of the organism we have tried to grow it by using different amounts of the acid, but in no amount that I have so far tried is the degree of growth to be compared to that derived by the Nowak method. I have succeeded in getting one culture to grow as well aerobically as it will by the Nowak method, by accustoming subcultures to grow in serum-gelatin-agar, the growth beginning about 2½ to 3 mm. below the surface of the medium, and gradually developing upward and downward. At the end of a few days the growth reached the top of the tube. After a few days incubation at this point streaks were made on agar slants where some growth occurred, and successive transfers were then made from one slant to another until the bacillus grew as readily, as far as I could see, in the air as it did by the Nowak method.

Herd No. 2 is situated some distance from Lexington, and has been gotten together during the past two years. It consists of about thirty-five females, of which during the past year and a half twenty-four have aborted. Eighteen cows had aborted when I began work with the herd. I examined the uterine exudate of four of these cows and obtained pure cultures of the Abortus-bacillus, Bang, from two of them, and in mixed culture in one instance. Material from the fourth cow was taken from the uterus on the tenth day after aborting. Stains and cultures from the same revealed a diplococcus in large numbers. I am quite sure, however, that this organism gained entrance to the uterus after the expulsion of the foetus.

Herd No. 3 consists of ten cows. One aborted and we obtained cultures of the germ of abortion from the foetus and afterbirth. We have made a few examinations from two other herds of aborting cows during the summer, but the material came to us so badly putrefied that it was impossible to do very much with it.

Inoculation Experiments.

Up to the present time we have injected eight pregnant guinea pigs subcutaneously with pure cultures of the organism, and seven of these pigs aborted. The period between the injection of the culture and the premature delivery of the foetuses in the several instances are as follows: 36 hours, 5 days, 11 days, 13 days, 21 days, 36 hours, 8 days. The ones aborting in the short time received larger doses of the germ than did the others. One of these sows delivered her pigs full time. The uteruses of the pigs then went 13 and 21 days before aborting showed abscesses at their placental attachments. The germ of abortion were in these abscesses in tremendous numbers. The sow that went 21 days passed four foetuses, of which two were apparently fully developed, though dead; the other two possessed no hair and were very much shrunken. All the sows were chloroformed after aborting and cultures of the Bang bacillus always obtained at the seat of inoculation.
and from the interior of the uteruses. In two instances we obtained a culture from the heart blood and from the liver of the mother, and in one instance from the liver of a foetus. We never secured a culture from the heart or liver of the mother if the abortion took place several days after inoculation. Dr. Bang was able to produce abortion in cows by intravaginal injections of pure cultures of the bacillus, the incubation period being from 70 to 80 days after the first inoculation. He was able to produce the disease in the mare by introducing intravenously a pure culture of the germ. MacFayden and Stockman of Great Britain were able to produce abortion in eight cows with the intravenous injection of the virus, and in pure culture and in three out of four instances by feeding it to cows.

Horses.

Infectious abortion is a disease that has caused the loss of thousands of dollars to the breeders of thoroughbred and standardbred horses of the Blue Grass region of Kentucky. In some seasons past as high as 75 per cent of the mares on certain farms have aborted. The mares in this region have during the past four or five years been comparatively free from this disease. However, there are occasionally outbreaks of the disease in studs resulting in a heavy loss of the foal crop. The mares are commonly bred soon after they foal in the spring, and some abortion may appear in an infected stud of mares, at the time the foals are weaned in late fall, and then occur with increased virulence during the late winter and spring months. It has been the observation of some that most of the mares abort in the eighth month of gestation. Some breeders believe that the trouble is due to the mares eating frost-bitten grass, or the eating of too much succulent feed; some say it is due to mal-odors, i.e., if the foetus and afterbirth are not removed from the field at once and the place on the ground where they lay covered with dirt that the other mares in the field will begin to abort. Others are quite positive that the trouble is due to some microbe and have aided us in our work in getting at the etiology of the disease. The writer has done more work along the etiology of the disease in cattle than in horses. Our technique in working with aborting mares for the past year has been the same as is used in isolating the Abortus bacillus, Bang, from the foetuses and foetal membranes of aborting cows, but in no instance have we isolated that organism. Last spring the writer secured a foetus from an aborting jennet. There were five jennets on this farm and they all aborted. The foetus was brought as soon as dropped to the laboratory and opened up under aseptic conditions. We obtained a short bacillus in large numbers and in pure culture from the heart, liver, spleen, stomach, intestines, kidneys, uterus (female foetus), ovaries and lymphatic system. This fall I obtained the same germ from the internal organs of a foetus of an aborting mare as well as from the uterine exudate from this mare. We also secured the germ from the afterbirth of another aborting mare on this farm, the foetus of which was burned before the veterinarian reached the place. While the veterinarian who was aiding us in this work was away for a day two other mares aborted on this place. The following day he inserted at our request sterile test tubes in to the uterus of these mares, filled the same with the discharge and brought them to the laboratory. The germ in question was obtained from this material as well as another bacillus, the biological properties of which we have not as yet determined. We have worked of late with two other foetuses of aborting mares on other farms with negative results, though I am informed
that from the symptoms of these mares were not affected with abortion of an infectious type. We inoculated one guinea pig late this summer with a pure culture of this germ secured from the foetus of a jennet, and she aborted in twelve days and the germ was secured from the point of inoculation and from the uterus of the mother pig. The germ is a non-spore bearing short bacillus with rounded ends. The colonies of this bacillus obtained by plating directly from the tissues and incubated several days are glassy in appearance and homogenous. Under the low power of the microscope they appear granular (like fine felting) and homogenous. So far in my investigations this germ presents the following physiological characteristics: The growth resulting from streaks of tissue on petri dishes may vary considerably as to size and form; when streaked on agar and incubated a few days it produces a dry, non-glistening growth which presents thin wrinkles at the lower end of the streak; does not liquify gelatin; developed 55 per cent gas in 1½ per cent glucose bouillon in 24 hours and 10 per cent of gas in the bile tube in 48 hours; and did not coagulate milk, even after being incubated 15 days. At first I was inclined to believe that it was a type of the colon bacillus, but taking all the above biological characteristics into consideration, it is evident that it is far from being a typical colon, though I am not as yet satisfied that it does not belong to that group. I do not wish to be understood at this time as saying that this germ is the cause of abortion in mares of our region. I am simply giving the results of my findings as far as they go. I have not run across the streptococcus found by Ostertag of Germany in the foetal membranes of aborting mares in our region. At the present time I know of no germ that is universally accepted as the cause of the disease in mares, but it appears quite probable that the Abortusbacillus, Bang, is responsible for infectious abortion in cows to some extent, to say the least, as it has been found associated with the foetal membranes of cows affected with abortion of the infectious type in Denmark, Hungary, Austria, Holland, England and the United States.

OUTLINE OF EXPERIMENTAL WORK ON INFECTIOUS ABORTION OF CATTLE.

By Dr. Ward Giltner, Assistant Bacteriologist Michigan Agricultural College.

We decided to take up the subject of infectious abortion of cattle as a problem for research because we had reached the following conclusions:

1. The disease is of economic importance to a greater extent perhaps than any other disease affecting pure-bred cattle. The problem of control will furnish a basis for consistent, progressive effort for at least a generation.

2. It is undoubtedly caused by Bact. abortus (Bang), which has been found by ourselves as well as by independent workers in a number of countries.

3. The disease cannot be controlled by ordinary methods of isolation and disinfection and it does not necessarily die out in a herd.

4. There is absolutely no therapeutic agent or system of treatment yet discovered or devised that will prevent an infected cow from aborting or will render a prospective breeding cow immune.
5. The nature of the disease indicates that immunity may be produced by a process of vaccination based on the use of living or dead cultures of the germ.

6. The theory upon which these infections will operate cannot be outlined as yet, but probably their action will be similar to the bacterine which stimulate the production of opsonins and favor phagocytosis. There is no evidence of toxin formation (at least systematic), therefore no call for an anti-toxin.

We were first confronted with the immediate problem of dealing with the aborting cows in two large herds and by correspondence in many other herds. The annual report of the Bacteriologist for 1910 shows the results of the use of lactic acid and cultures for irrigating the genital organs of cows that have aborted. We have used both the ordinary lactic organisms and Bact. bulgaricum with such favorable results that their use has become a regular practice in this connection.

We have isolated an organism from the cotyledon of an aborting cow that corresponds to the description of Bact. abortus. We have also studied the culture isolated by Dr. W. J. MacNeal. An attempt is being made to produce rich culture of these organisms in liquid media for serum tests, for immunization work with heifers and for the manufacture of "abortin" after the method of McFadyean and Stockman.

We have attempted to immunize a virgin heifer by subcutaneous injections of living cultures of Bact. abortus. This heifer has been since bred, and after four months inoculated, together with an untreated pregnant heifer, intravenously with a pure culture of the same organism. The injection for immunization caused a rise of temperature of about two degrees after several days and an increase in the agglutinative power of the blood from 1-10 to 1-250. It is as yet too early to report on the outcome of this experiment.

We have produced abortion in pregnant guinea pigs and are planning to use rabbits and guinea pigs in this work, but have made little progress.

The Chairman: Dr. Larsen has prepared a paper which reached us too late to put on the program, and we will now give the floor to Dr. Larsen for a few minutes.

CONTAGIOUS ABORTION OF CATTLE.

By W. P. Larson, M. D., Demonstrator of Pathology and Bacteriology, University of Minnesota.

There is probably no animal disease that the dairyman fears more than contagious abortion of cattle. There is no animal disease which causes so great a loss to dairymen and stock breeders as the one under discussion.

Although fully fifteen years have elapsed since Bang and Stribolt announced their discovery of the etiological agent of epizootic abortion, very little or no progress has as yet been made from the standpoint of therapeutics or prophylaxis.
Attempts to isolate the cocco-bacillus of Bang have been made by numerous American bacteriologists since the publication of Bang's and Stribolt's work, but with the result that there have been nearly as many different organisms isolated as there have been researchers.

As far as I know, no one has as yet conclusively proven that the disease as we have it in this country is identical with that of Europe.

In taking up the study of this disease it seemed to me that the question of identity was the first to be solved. This I proposed to do by the complement fixation reaction, using Bang's original culture as antigen.

In view of the very limited time this afternoon and out of consideration for the other speakers who are scheduled to follow me, I will not detain the gentlemen with a detailed report of my work with the complement fixation reaction—which will be published in detail in the very near future—but limit myself to the statement that contagious abortion in this country is identical with that of Europe.

I have further found the complement fixation reaction to be an accurate method of diagnosing contagious abortion of cattle. Having thus an accurate and scientific method of diagnosing the disease, as well as establishing the identity of the etiological agent of epizootic abortion, the question arises: What can be done to combat this disease?

From the standpoint of therapeutics the outlook at present is discouraging. More is to be expected, however, by way of prophylaxis.

Hitherto we have accomplished very little with bacterial vaccines. This is probably due to the fact that we are unable to isolate the so-called endotoxins and consequently are unable to produce anti-endotoxines. As far as can be determined the bacillus abortus produces neither soluble toxines nor endotoxines. This is a point of great practical importance.

The very interesting fact has been pointed out by Metchnicoff and since confirmed by numerous researchers in the field of immunity, that to produce an immunity against the germ itself is one thing, but to produce an immunity against the toxines of this germ is quite another matter.

Metchnicoff has shown that it is quite possible to immunize certain monkeys, which are susceptible to typhoid fever, against a subcutaneous infection of the typho-bacillus, but when these immunized anthropods were given a culture per os they succumbed to typhoid fever as readily as did the controls.

A priori with a disease as contagious abortion of cattle, caused by an organism which produces neither soluble toxines nor endotoxines, it does not seem improbable that we should be able to effectively vaccinate animals against an infection by this organism.

Encouraging in this connection is the fact that a natural infection usually terminates in immunity.

In my work with the complement fixation reaction I have sometimes found that young animals which were born into an infected herd gave a positive reaction, i.e., showed signs of having been infected, and yet terminate
pregnancy normally. The fact that these animals do not abort is undoubtedly because they have been infected during early life, and by virtue of this infection have become immune to contagious abortion before their term of pregnancy began.

It is very probable that the time to begin vaccination against contagious abortion is during the early life of the animal. Work is now being carried on at the University of Minnesota to determine whether or not it is possible to immunize against the disease in question, and at what age it is most practical to begin vaccination.

Dr. Hadley: Mr. President, may I have a few minutes? Dr. Larsen has overlooked a rather important matter, at least it is important to me. In the first place, practically all of the work outlined in this report was done under the auspices of the Veterinary Agricultural and Bacteriological Department and in the laboratories of the University of Wisconsin. Therefore, I think I can say that Dr. Larsen overlooked something. I personally drew blood from each one of those animals he speaks of, and the work was carried out in cooperation with Dr. Larsen. I simply want to put the matter straight, and I am sure Dr. Larsen will support me in that regard.

In order to give you an illustration of the practical value of this test I will make a short report concerning the last herd upon which we tried it out a few days ago. We were called to the herd in question to determine, if possible, the cause of the death of calves which died a few hours after being dropped. A careful study of the surroundings, together with a post-mortem examination of a calf, revealed the fact that calf dysentery was present and the cause of the trouble. We advised the use of a polyvalent dysentery serum (Pasteur). As an additional precaution we drew small quantities of blood from each of the six cows which had recently dropped calves, for the purpose of making the test for contagious abortion when we returned to our laboratory. All the above mentioned calves died soon after birth. We had no suspicion of contagious abortion at this time, as all evidence pointed to other sources of trouble. Upon examining the blood serum of these six cows we found, with one exception, that all responded negatively to the test and were, therefore, pronounced free from infection. The exception was a pure-bred Guernsey cow, four years old, which gave a most beautiful positive reaction, indicating infection with the bacillus abortus. Please understand we had no previous information about abortion, and even at the time referred to had no clinical evidence to support our results with the complement fixation test. Upon writing the
owner he replied that the cow calved properly in 1909, which calf is now a desirable heifer. In 1910, however, the cow aborted, as did two or three of the other young cows in this herd. This report was especially pleasing to us, as it supported our test in every detail, and is but one of many cases which shows how really remarkable and accurate it is.

Now, gentlemen, the great value of this test must be apparent to you all. Previously no method was known by which contagious abortion could be kept out of a herd. A stockman may test his cattle for tuberculosis, but contagious abortion has been a bug bear with which he has been unable to cope. We feel confident that this method will prove of especial benefit to community breeders' associations and similar organizations, also to individual owners of valuable cattle. As an aid to the study of the epizootiology of the disease and proper sanitary control of infected herds, it should be of inestimable value. Our enthusiasm is great because clinical history has been supported in practically every case where the test has been applied. We believe the possibilities which lie in this test cannot be overrated. It is, unfortunately, a laboratory procedure, so must be carried out by well trained serologists in properly equipped laboratories.

Simply as a matter of interest, I may add that our client reports that the polyvalent dysentery serum is having a splendid effect on the young calves. One of them was nearly dead, but after the administration of the serum recovered and is now doing very well. Each newly dropped calf is at once given ten c. c. of the serum as a preventive for the scours, with excellent results. Previous to the administration of the serum it was impossible to keep calves alive for more than a few hours.

Another thing that we are doing is to keep our herd free from this disease. We have eliminated every animal which has responded to the test. What we propose to do is to keep that herd free from further infection by simply testing each animal which we propose to introduce into that herd. I cannot now see how the test can fail.

In closing, let me say that our work with the serum diagnosis of contagious abortion is progressing very nicely. By this time next year we hope to have advanced far enough in the field so as to be able to give a more complete account of the application of this agent in practice.
Dr. Mohler: Mr. Chairman, I have been very much interested in the paper presented by Dr. Larsen, and particularly in that portion relating to those two and three year old heifers which are supposed to be immune on account of having been reared in an infected environment. I am at present conducting certain investigations which I think will probably throw some light on this particular phase of the subject. After having isolated the bacillus abortus from the stomach of a foetus and from the placenta, I found the abortion bacillus accidentally in the milk of certain cows in an aborting herd. The usual sanitary precautions were taken with reference to the disinfection of the parts, the washing of the udder and the tests with antiseptic solutions, as well as the withdrawal of the foremilk before taking the samples for injection into guinea pigs. From the necrotic lesions found in the guinea pigs so inoculated the abortion bacillus was recovered, and it is the presence of this organism in the milk which to me is very suggestive. We are now collecting from the herd book the various records of heifer calves produced in this herd, as well as such calves produced in other herds where infection has been known to exist for a number of years, with a view to discover the very point which Prof. Larsen has brought up this afternoon, namely, whether these calves from aborting cows obtain immunity from drinking infected milk or by other similar exposure to infection during early life and as a result carry their calves to maturity. We have also done some experimenting with vaccination in several of these herds, looking to the control of infectious abortion, but the work is still in the experimental stage. With reference to the complement fixation test for this disease, I can only add that our results are not different from Prof. Larsen's. This test is almost as satisfactory in the detection of contagious abortion as it has proved to be in the diagnosis of glanders and several other diseases.

The President: Dr. Peters will now present his paper on treatment of hog cholera with attenuated virus.

TREATMENT OF HOG CHOLERA WITH ATTENUATED VIRUS.

By Dr. A. T. Peters, Director Illinois State Biological Laboratory.

After experimenting for a number of months in the laboratory with virulent blood to ascertain at what temperature blood could be used for vaccination, a method was devised by which this vaccine was used in the field. After the discovery by Dr. Dorset that the blood of animals affected with hog cholera contained a filtrable virus, experiments were conducted to attenuate
this virus by heat. In looking through the literature for similar experiments we did not find any data in reference to at what temperature this virus could be destroyed. Therefore we took as a basis Dr. Moore's experiments with the hog cholera bacillus cited in his book on pathology that the bacillus of hog cholera died at a temperature of fifty-eight degrees. Experiments along the same line with the blood were conducted at a temperature of sixty, which was found safe to inject into hogs without producing the disease. We found that virus heated at a temperature of fifty would produce the disease, usually in a fatal form.

The method of preparing the vaccine was as follows: The virus was secured from an acute case of hog cholera. It was then allowed to stand in the jar and the serum was drawn off. This serum was then placed in an Eri Myer flask and put in a hot water bath and subjected to a temperature of sixty degrees for half an hour. It was then allowed to cool and bottled, to which a small amount of carbolic acid was added. In this way it was sent out and used in the field. The dose used was as follows:

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<th>Weight</th>
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<td>50 lbs and under</td>
<td>2 c. c.</td>
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<tr>
<td>100 lbs and under</td>
<td>2 1/4 c. c.</td>
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<tr>
<td>200 lbs and under</td>
<td>3 c. c.</td>
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To each 100 lbs add 1 c. c. when over 200 lbs.

This vaccine was used in the field largely on account of the fact that we could not supply the demand for serum and in each instance the owner was informed that this material was still in the experimental stage; that we were only giving it out on account of the fact that it had proved satisfactory in laboratory experiments and that from the laboratory results it seemed sure that we could not produce any disease with this material. In this way hundreds of farmers who came to visit the office and laboratory (repeating their own language) said they would be glad to take a chance on this material. Therefore we have treated in the neighborhood of some 26,000 head of hogs with this material. Owing to the fact that it is extremely difficult to secure reports, we have only accurate reports on 12,074 head of hogs treated by this method. Of this number there were 1,477 sick at the time of treatment and 443 had died in these herds before treatment and there had died after treatment 2,464, a loss of 20 3-10 per cent and a saving of 79 7-10 per cent. These are the results of this method which has not had a great deal of time to be perfected in all its details. I admit that there are a great number of questions that should be more carefully investigated regarding this method, and it probably would not have been used in the field so early had it not been for the owners of hogs requesting it.

Dr. Reynolds: Mr. Chairman, It seems necessary that we should all have as much information as is now available on such an important question as that raised by Dr. Peters. A reduced virus vaccine for hog cholera capable of universal application is a matter of such tremendous importance that we should all contribute whatever information we may have concerning it for the general good.
On learning of Dr. Peters’ work with the reduced virus vaccine we started some work of our own, wishing to corroborate if possible his results and get this line of vaccine work started for Minnesota. Dr. Boyd, who has charge of our hog cholera vaccine work, was instructed to prepare some vaccine as nearly as possible according to the Peters method. Two pigs were inoculated with the vaccine so prepared and both developed cholera as a result. One developed an acute case in about the same time as our virus pigs inoculated by Dorset-Niles serum by unmitigated virus, and was killed and used as a virus pig. The other developed into a rather chronic case of cholera and died in about seventeen days.

Correspondence with one or two friends whom I know were also trying out this method, gave on the whole rather unsatisfactory reports and our work by this method was not carried any further.

I would like to ask Dr. Peters if he has any data that he can give us with reference to the use of this virus vaccine with unexposed susceptible animals; for instance, where they were presumably susceptible, and were unexposed as far as known.

Dr. Peters: I could not give you the information on that, Doctor.

Dr. Reynolds: When do you commence counting the thirty minutes

Dr. Peters: When the thermometer reaches a temperature of sixty in the serum.

Dr. Spencer: Doctor, have you made active field exposures with it in contact with sick hogs?

Dr. Peters: No field exposures.

Dr. Spencer: Have you made laboratory exposures?

Dr. Peters: Yes, sir. Our laboratory experiments have been uniformly good and that was the reason we used it in the field. The success in the field has not been uniformly good.

Dr. Spencer: Have you tested the attenuated virus against active virus?

Dr. Peters: No.

Dr. Spencer: How about coagulation? You simply pour off
the clear serum that you use, don’t you? Do you take it after it is heated, or do you shake it up?

Dr. Peters: You don’t get any coagulation; we have not been troubled that way.

Dr. Spencer: You have not had to filter?

Dr. Peters: No.

Dr. Spencer: What percentage of carbolic acid do you use?

Dr. Peters: The same solution as we use for the serum.

Dr. Spencer: Ten per cent of a five per cent solution?

Dr. Peters: Yes.

Dr. Spencer: On the 31st of October I made some experiments (record of which I happen to have here) that I carried through the same procedure that you did, excepting that I made the attenuated virus experiment upon exposure, confining my operation entirely to virus upon exposure, and I think I carried that out as carefully as it could be carried out. I got hog cholera developed unquestionable in those cases. I waited until the thermometer got to sixty, I had approximately the same carbolic acid that you did, my pig was a sixty-pound pig and I gave two c. c.’s, followed immediately with exposure in virus pens. I did not do exactly as you did; I did not let the blood stand and draw off the serum; I just took the blood.

Dr. Peters: Letting the blood stand is merely a matter of securing more serum. I gave the results of the work in the field. There is a fluctuation, as Dr. Dorset has well said, and I cannot understand just why we had good results in the laboratory and not in the field. It probably would not have been used to such a great extent, if it had not been that the people came there and wanted it, and that it was easier to manufacture than the other. I have discussed it with other laboratory workers by correspondence, and they have had practically the same results as Dr. Dorset described.

Dr. Reichel: There is a great deal of difference in hog cholera virus; also in the susceptibility of hogs. I would like very much to know from Dr. Peters if he used the same strain every time, and if he knows anything about the susceptibility of the hogs he used the virus on.

Dr. Peters: Of course, if the laboratories are going to continue
any of this experimental work this serum vaccine, or whatever it may be called, would have to be tested out the same as the test for serum. Then possibly this method might have a future, because, as the doctor said that certain strain has a great deal to do with it. We know that one of the great worries of the directors of a serum plant is to secure virulent blood. Many of the samples of blood that we secure to make our hyper-immunes with do not always give results. A weak serum will be the consequence. Possibly the results would have been more encouraging had we used the tested serum. From the reports that I have had from my colleagues they used a stronger strain of virus, and that is the only way I can explain our results.

RESEARCHES ON HOG CHOLERA.

By M. Dorset, Bureau of Animal Industry, Washington, D. C.

I wish to present a brief report of experimental work carried out during the past season. In some cases the experiments are not complete, but the results thus far obtained seem to warrant their presentation at this time.

Attenuation of Hog Cholera Virus by Heat.

Dr. Peters has this afternoon given the results of his experience with the use of heated virulent blood for protecting hogs against hog cholera. His original announcement at the meeting of the American Veterinary Medical Association at Toronto was of interest, and we have endeavored during the summer to substantiate his findings. We have used two distinct lots of virus. The blood was heated at sixty degrees C. for thirty minutes. In one lot all of the virus was carbolized immediately after heating and cooling. In the other lot half of the heated virus was carbolized, while to the other half no addition was made. The carboxylic acid was added in amount sufficient to secure a concentration of one-half per cent.

In the first of these two experiments where all of the blood used was carbolized, the first inoculations were made with this heated carbolized virus twenty-four hours after heating and adding carboxylic acid. Two non-immune pigs were then each given 2 c. c. of the heated carbolized virus. Two non-immunes were given on the same date 5 c. c. of the same blood which had not been heated and contained no carboxylic acid. All of these pigs contracted hog cholera and showed typical lesions at autopsy. Three days after heating two additional non-immune pigs were injected with the same heated carbolized virus, the dose given being 2 c. c. administered subcutaneously. Both of these pigs contracted hog cholera. One died of the disease. In the case of the other hog the disease developed into a chronic form and the hog was apparently rendered worthless.

In the second experiment the virus which was used was divided into three parts. One part was not treated in any way; a second portion was heated and after cooling sufficient carboxylic acid was added to secure a concentration of one-half of one per cent in the mixture; the third portion was heated, but no carboxylic acid added. In this experiment, immediately after heating, three
hogs were inoculated with 2 c. c. of the heated but not carbolized blood; three with the same blood after heating and addition of carbolic acid, and two with the same blood which contained no carbolic acid and which was not heated. All of these hogs contracted hog cholera. One of those which received the heated and carbolized virus recovered. The other died of hog cholera as the result of the injection.

The second test of the immunizing properties of this lot of treated virus was made two days after heating, as follows:

Two hogs were each inoculated with 2 c. c. of the heated and carbolized virus; two received the same amount of the virus, which was heated but to which no carbolic acid was added. All of these hogs contracted hog cholera; one finally recovered.

The work with heated virus may be summarized as follows:

Fourteen non-immune hogs received heated virus. All of these contracted hog cholera from the injection and twelve died of the disease.

Our experience in this work is similar to that noted in previous experiments. We have found that it appears to be impossible to attenuate the hog cholera virus uniformly. At times, by employing certain methods of heating either the liquid blood or the blood after drying, we find that the virus may be apparently attenuated so that it actually produces an immunity without injury to the inoculated pigs. In other instances, using precisely the same technique, but possibly a different lot of blood, the inoculated pigs instead of being immunized may be killed by the injection, or, as a third contingency, they may not be affected in any visible manner and a subsequent test will show that they possess no immunity whatever, thus indicating that the virus had been destroyed by the heating process.

It is our opinion that the employment of hog cholera virus supposed to be attenuated by heat is dangerous because such inoculations may set up disease in localities where it had not previously existed. Even if it does not set up disease it may not and from our experiments we think it more than likely that it will not, protect the injected animals from hog cholera. From the preceding statements it will be clear that we have been unable to substantiate the claims made by Dr. Peters.

The Effect of Disinfectants Upon the Virus of Hog Cholera.

During the past season we have continued our study of the effect of various chemicals upon the virus of hog cholera.

We have previously reported informally the results of preliminary work along this line. It will be remembered that the earlier experiments showed that carbolic acid in a strength of 3.1-3 per cent failed to destroy the virus after a contact of one hour. It was likewise found that mercuric chloride in a concentration of 1 to 1,000 failed to destroy the virus within an hour. On the other hand, compound solution of cresol in a concentration of 3 per cent destroyed the virus completely after one hour's contact. These experiments were important from a practical standpoint as indicating that neither carbolic acid nor bichloride of mercury are suitable disinfectants for use in outbreaks of hog cholera, whereas compound solution of cresol is apparently well suited for this purpose.
The behavior of the virus of hog cholera toward antiseptics and preservative agents is also important from the standpoint of the serum producer. Practical work in the production and application of anti-hog-cholera serum has shown that it is very desirable to secure some method of preservation of the virus. This is required because it is often neither possible nor desirable to use virulent blood immediately after drawing.

In the case of virus for use in simultaneous inoculation it is usually desirable to preserve the virulent blood for several days, and it would undoubtedly be an advantage to be able to keep this blood for several weeks.

With regard to virus for hyperimmunization, it is often found that an immune hog is not available for injection at the time the disease-producing blood is secured, and unless we have some means of preserving this blood considerable loss will result. The problem in the preservation of blood for simultaneous work consists in securing some disinfectant which will either destroy or inhibit the growth of extraneous micro-organisms without weakening to any material degree the filterable virus of hog cholera. The nature of the chemical added, that is, with regard to its poisonous properties, is not of great importance in preserving blood for simultaneous inoculations, for in this case only very minute amounts of blood are injected into the hog. In the case of blood to be preserved for hyperimmunization, however, since the volume of blood injected is so large, it is necessary to use a substance which, when introduced into the body of the hog, either subcutaneously or intravenously, will be without serious ill effect upon the health of the hog.

Our experiments have been divided into two parts. The first dealt with the preservation of blood for simultaneous inoculations; the second, the preservation of blood for hyperimmunization.

Preservation of Virus for Simultaneous Inoculations.

In the preservation of blood for simultaneous inoculations we have employed as preservative agents carbolic acid, formaldehyde and thymol. Four separate series of experiments with four different lots of virulent blood were carried out. It is not necessary at this time to refer to the details of these experiments. In all cases the virulence of the blood was determined before the addition of the preservative. Bacterial counts on the blood were also made before as well as after the addition of the preservative. The results are briefly as follows:

1. Carbolic Acid—One per cent carbolic acid does not destroy the virulence of hog cholera blood after contact of four weeks, the preserved virus being kept during this time in an ordinary refrigerator (Temp. 6 degrees C.). Bacteria ordinarily found in the blood of sick hogs, such as Bacillus suipustifer, have been found to be certainly destroyed at the end of two weeks, and probably very much sooner, by one per cent carbolic acid. Simultaneous inoculations made by the use of carbolized blood and serum appear to confer an immunity which is quite as lasting as that secured when the uncarbolized virulent blood is employed.

2. Formaldehyde—Formaldehyde was employed in the proportion of 1 to 10,000 and 1 to 12,000. This is equivalent to approximately 1 to 4,000 and 1 to 5,000, respectively, of the ordinary 40 per cent aqueous solution of
formaldehyde of commerce. Formaldehyde destroys all of the ordinary bacteria found in the serum within two weeks, but the virulence of the filterable virus of hog cholera appears to be unaffected even after four weeks' contact at ice-box temperature. We have carried out no simultaneous inoculations with formalized blood.

3. Thymol—In most of the experiments with this substance thymol crystals have been added to the blood in the proportion of one-half gram to 100 c. c. of blood. In one case thymol was added in the proportion of five grams to 100 c. c. of blood. The thymol does not seem to be as effective as either carbolic acid or formaldehyde in destroying the ordinary bacteria found in blood taken from sick hogs, though usually at the end of four weeks the virulent blood in the thymol experiment was found to be free from the ordinary visible bacteria. In no case was there any noticeable effect by the thymol upon the virulence of the hog cholera virus.

These experiments show clearly that hog cholera blood may be preserved for four weeks by using either one of the three named disinfectants. They show, furthermore, that all of these disinfectants tend to destroy the extraneous micro-organisms which may be present in the blood. We have carried out simultaneous inoculations, using carbolized blood with excellent results, and there is no reason for believing that equally good results cannot be obtained by employing in simultaneous inoculations either formalized or thymolized blood.

Aside from the mere matter of preserving the blood, the use of one or the other of these disinfectants in virulent blood employed in simultaneous inoculations serves to prevent complications as a result of the presence of bacteria, such as Bacillus suipestifer, which may be found in virulent blood at the time it is drawn.

We have one experiment in which three lots of blood containing respectively one per cent phenol, 1 to 10,000 formaldehyde, and one-half gram thymol to 100 c. c. blood, were preserved for two months without any apparent effect upon the virulence. Carbolized virus, or virus preserved with some other suitable antiseptic, is recommended for all simultaneous inoculations.

Preserving Virus for Hyperimmunization.

Carbolic acid could not, of course, be used for preserving blood for hyperimmunization on account of its toxicity. Thymol, in proportions varying from one-half gram to 100 c. c. blood, to five grams to 100 c. c. blood and formaldehyde, 1 to 10,000 and 1 to 12,000 were employed. The virulence of the blood was tested before the preservatives were added as well as at the time the preserved blood was used for hyperimmunization. In no case was there any noticeable effect upon the virulence. Bacterial counts on the blood both before and after the addition of the preservatives showed that the ordinary bacteria found in the blood are destroyed by the formaldehyde within two weeks and that even after one week's contact with the formaldehyde they are greatly diminished. The thymol, while tending to diminish the number of bacteria in the virus, does not seem to destroy them completely. In all ten different lots of disease-producing blood were preserved with one or both of these disinfectants, and hogs were hyperimmunized with this blood,
usually by the intravenous method, after the disinfectants had been in contact
with the blood for from one to three weeks. The formalized disease-producing
blood when injected intravenously in the usual dose for hyperimmunization
was without visible effect upon the immune hog, but the blood containing thy-
mol, on the other hand, appeared to be distinctly toxic, the degree of toxicity
depending directly upon the amount of thymol used for preserving the blood.
It was found frequently during the intravenous injection of thymolized blood
that the immune would cease breathing and in most cases would undoubtedly
have died except for the employment of artificial respiration. By this means
most of the immunes which were affected in this manner by the thymol were
revived and made an uneventful recovery. It appears, then, that virulent
blood containing sufficient formaldehyde or thymol to inhibit or destroy the
extraneous micro-organisms which may be present in such blood may be kept
in the ice-box for from one to three weeks and then used for hyperimmuniza-
tion without serious injury to the immunes. This is certainly true with
 REGARD to blood preserved with formaldehyde. There is some danger in the
case of blood preserved with thymol.

We have not completed a test of serum drawn from all of the hogs hyper-
immunized with this preserved virus, but a sufficient number of tests have
been made to show that serum from such hyperimmunes will protect pigs
weighing less than 100 lbs when given in doses of 15 and 20 c. c.

We do not regard these tests as absolutely conclusive in showing that
preserved virus can be used regularly in practice as a substitute for virulent
blood freshly drawn from sick pigs, but there is every indication that this may
be done. Certainly the results of these experiments are sufficient to warrant
the employment of preserved diseased blood for hyperimmunization in a
tentative way at least by those who are engaged in the practical manufacture
of anti-hog-cholera serum.

Immunity Against Hog Cholera in the Offspring of Immune Sows.

For a number of years experiments were carried out in the Bureau of
Animal Industry with the object of determining whether or not a racial im-

munity against hog cholera could be established by selective breeding. In
beginning this work hogs were selected which appeared to possess a natural
immunity against hog cholera. They had been exposed to the disease but
had never exhibited any symptoms of illness. The young from these immune
hogs were exposed to hog cholera and the survivors of this exposure were
later mated and their litters in turn were tested for immunity. These tests
extended over several years and through a number of generations of hogs, and
Dr. Niles, who had immediate charge of this work, has already reported
informally that pigs from immune sows possess more resistance to hog
cholera than pigs from non-immune sows, but it did not appear possible by
the process of selective breeding to increase the resisting power of pigs to
such a point that this resistance appeared to be of much practical importance.

In this earlier work, the pigs when exposed to hog cholera were in all
cases at least two months old. It has, of course, long been known that
females which have been actively immunized against certain infectious diseases
transmit to their young in greater or less degree a passive immunity against
the disease. The well known experiments of Chauveau, Arloing, Ehrlich and
others established this fact quite definitely. More recently, Theobald Smith and Anderson have shown that female guinea pigs which have been actively immunized by the injection of a mixture of diphtheria toxin and anti-toxin transmit to their young a passive immunity against the toxin. This immunity in the offspring disappears after a few months. It occurred to us that our earlier experiments, which were carried out on pigs at least two months old, might have indicated a greater degree of immunity in the offspring of immune sows had the tests of immunity been made within a short time after birth. Additional experiments have been carried out with the idea of testing this question. It should be noted that Craig (Bulletin, 140, Purdue Agricultural Experiment Station, February, 1910) has reported that pigs from two immune sows were apparently resistant to the disease up to the time they were four weeks old, but that they later succumbed. Reynolds likewise (American Veterinary Review, volume 38, November, 1910) has tested the immunity of pigs from immune sows and reports that they show a high degree of resistance to hog cholera until they are from two to sixteen weeks of age. Reynolds suggests that inoculation with virulent blood during this immune period might be used as a practical method of immunization. The same idea had presented itself to us quite independently of Reynolds' work and while our experiments have not gone far enough to warrant an expression of opinion on this last named question, we feel that the results thus far obtained are worthy of report at this time. I will not go into the details, but will merely summarize what has been done.

We have tested the immunity of pigs three days old from three immune sows, from one hyperimmune sow and from two non-immune sows. We have also tested the immunity in pigs three weeks old from five immune sows, making a total of eleven litters tested—eight from immune sows, one from a hyperimmune sow and two from non-immune sows. All of these pigs were injected subcutaneously with approximately one-half c. c. of disease producing blood to which carbolic acid had been added. The virulence of the blood was proven in all cases by the injection of non-immune pigs. The results of these experiments show that not a single pig from an immune or hyper-immune sow died from the injections or showed any ill effects therefrom, whereas all of the inoculated pigs from the two non-immune sows died promptly of hog cholera. Furthermore, the mothers of the two non-immune litters contracted hog cholera from their pigs and both died of the disease. These experiments seem to prove definitely that pigs from immune or hyper-immune sows are immune against hog cholera at birth and that this immunity lasts for at least three weeks. The earlier work carried out by Dr. Niles, in which tests were made on older pigs, of which a majority succumbed, leads us to the conclusion that probably the immunity possessed by the offspring of immune sows disappears after a few months. The exact time when this immunity becomes reduced to such a point that the hogs are no longer able to resist infection must be determined by further experiment. It likewise remains to be determined whether the injection of virus during the period of inherited immunity will result in a permanent immunity similar to that secured by the simultaneous method of vaccination. As the pigs under consideration have not yet been given a second exposure to hog cholera, we are not in a position to answer this question at the present time.

All of the experiments which have been very briefly reviewed were participated in by Dr. W. B. Niles, Dr. H. J. Shore and Dr. Clarence G. Cole.
to whom full credit is given for carrying out the practical side of this work.

HOG CHOLERA—V. B. VACCINATION (Virulent Blood).

By M. H. Reynolds, Experiment Station, University of Minnesota.

A preliminary report of this work was published as a claim for priority in the American Veterinary Review for November, 1910. The principles involved in this rest on the discovery that very young pigs from sows that have undergone the processes of active immunity are, as a rule, highly resistant to cholera and that this is rapidly lost as the pigs grow older.

It has been well known in a general way that hogs from previously immune dams have varying degrees of natural immunity and that most of them will die under exposure or inoculation, although perhaps showing some resistance.

So far as the writer knows it has not been previously shown:

(1) That very young pigs from immune sows are, as a rule, highly immune;

(2) That this is gradually lost in most cases; and,

(3) That this temporary immunity can be made comparatively permanent by inoculation with simple, unmitigated virus if given during this early immune period. It is obvious that this may be done at an insignificant cost.

Reynolds and Beach planned the later experiments together. To Dr. B. A. Beach belongs the credit for carrying out the later experiments as planned, for the keeping of records and for original suggestions concerning the conduct of the work and interpretation of results.

We find that after about five weeks of age this inherited immunity cannot be relied on, although some pigs retain immunity sufficient to resist direct inoculation until twelve or fourteen weeks old.

In our first preliminary report we were unable to give any information as to whether sows immunized by Dorset-Niles serum-virus method would produce highly immune pigs. During the present year we have accumulated some data on this subject, a summary of which will be given here.

At the time of our earlier report we had insufficient data upon which to base statement whether young sow pigs receiving V. B. vaccination would themselves produce pigs of sufficient immunity for this process. We now offer some data to cover this point, which is particularly gratifying.

Experiments with young pigs from susceptible sows have been limited, but indicate that they have no unusual resistance on account of age, but are very susceptible.

Attention is called again as in our preliminary report (see American Veterinary Review of November, 1910) to the fact that the original discovery of the underlying principle should be credited to the writer.

Reynolds and Beach planned the later experiments together. To Dr. B. A. Beach belongs the credit for carrying out the later experiments as planned, for the keeping of records, and for original suggestions concerning the conduct of the work and interpretation of results.
We keep our virus at the highest possible grade for our Dorset-Niles serum work by continually passing through light shots. Such virus has been purposely used in our V. B. Vaccine work. It is reasonable to suppose that if virus of lower grade, easily produced, had been used, our percentage of losses under V. B. Vaccination might have been still smaller. One-half a cubic centimeter, the dose which these young pigs received, is a very large dose of high virulence serum for such small and young pigs. In several instances litters have been injected with .5 c. c. of this virus at from five to seven days old, without harm. Smaller dose or less virulence may give permanent immunity, with still less risk and loss.

Every one familiar with the raising of young pigs knows that an important proportion of young pigs die under any conditions of feed and care. A portion of the young pigs reported here as dead were examined post-mortem. Conditions in other cases were such that a careful post-mortem was impossible. It was not practical for us to attempt inoculation of susceptible pigs from each V. B. pig that died. Some of the cases examined post-mortem were evidently cholera.

The reader will kindly remember that blood of the highest virulence was used on these little pigs in this preliminary work. Blood of very much lower virulence will probably produce all needed and permanent immunity and will probably be used in practical field work. Bear in mind also that our exposure in immune sows were taken more or less at random as to their periods since infection.

Early Work—Up to January 1, 1911.

The reader is asked again to bear in mind, while considering the following data, the high general mortality risk with very young suckling pigs and their small value when lost as compared with the older hogs usually immunized by other methods.

Brief mention of our earlier work appeared in American Veterinary Review, volume 38, No. 2. This is included here in the following later statement:

Up to January 1, 1911, we gave V. B. vaccination to 107 pigs six weeks old and under, from twenty-five exposure immune dams and V. B. immune dams, with a total loss of eight pigs from pigs from probable vaccination cholera.

Exposure immune dams—Eighty-nine pigs from about twenty-two exposure immune dams were inoculated with .5 c. c. virus with a loss of eight pigs—which may be reasonably charged to the vaccination.

During 1910 we studied the immunity held by young pigs of greater age. In this work we inoculated sixteen pigs from five exposure immune sows. These pigs covered in age seven to fourteen weeks. There died nine, mostly plain cases of cholera. This, as well as later experience, indicates that V. B. vaccination should not be used for pigs over five weeks old.

*This does not include one little runt which died, cause unknown, and which should not have been included in the experiment. It does not include two pigs which died with a diagnosis of probable pneumonia other than hog cholera, or one pig which died after receiving 1.5 c. c. virulent serum; i. e., three times the standard dose of .5 c. c.

*Not counting one entire litter of seven pigs from a sow of uncertain history.
V. B. Vaccine Sows—This means sows that had been given treatment by
our method when little pigs the year before. During this same period eighteen
pigs under six weeks old from three such sows were inoculated with no losses.

Summary V. B. vaccination to January 1, 1911, by age of pigs treated.

From Exposure Immune Dams.

<table>
<thead>
<tr>
<th>Age, Number of days.</th>
<th>Number of pigs.</th>
<th>Dose of virus.</th>
<th>Results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5..................7</td>
<td>.5 c. c.</td>
<td>No. losses.*</td>
<td></td>
</tr>
<tr>
<td>9..................14</td>
<td>.5 c. c.</td>
<td>2 died; pneumonia.</td>
<td></td>
</tr>
<tr>
<td>12..................3</td>
<td>1.5 c. c.</td>
<td>I died; probably cholera.</td>
<td></td>
</tr>
<tr>
<td>14..................4</td>
<td>.5 c. c.</td>
<td>No losses.</td>
<td></td>
</tr>
<tr>
<td>21..................9</td>
<td>.5 c. c.</td>
<td>2 died; probably cholera.</td>
<td></td>
</tr>
<tr>
<td>28..................45</td>
<td>.5 c. c.</td>
<td>5 died; probably cholera.</td>
<td></td>
</tr>
<tr>
<td>35..................3</td>
<td>.5 c. c.</td>
<td>1 died; cholera.</td>
<td></td>
</tr>
<tr>
<td>42..................4</td>
<td>.5 c. c.</td>
<td>No deaths.</td>
<td></td>
</tr>
<tr>
<td>49..................4</td>
<td>.5 c. c.</td>
<td>2 died; one developed chronic cholera; stunted in growth; finally recovered.</td>
<td></td>
</tr>
<tr>
<td>56..................3</td>
<td>.5 c. c.</td>
<td>2 developed chronic cholera; finally recovered.</td>
<td></td>
</tr>
<tr>
<td>72..................6</td>
<td>.5 c. c.</td>
<td>2 weaned and 2 unweaned died of chronic cholera. The remaining 2 weaned pigs were very unthrifty.</td>
<td></td>
</tr>
<tr>
<td>84..................2</td>
<td>.5 c. c.</td>
<td>Both died after several weeks; chronic cholera.</td>
<td></td>
</tr>
<tr>
<td>98..................1</td>
<td>.5 c. c.</td>
<td>Chronic cholera; died after three weeks.</td>
<td></td>
</tr>
</tbody>
</table>

From V. B. Immune Dams.

<table>
<thead>
<tr>
<th>Age, Number of days.</th>
<th>Number of pigs.</th>
<th>Dose of virus.</th>
<th>Results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14..................11</td>
<td>.5 c. c.</td>
<td>None sick.</td>
<td></td>
</tr>
<tr>
<td>21..................7</td>
<td>.5 c. c.</td>
<td>None sick.</td>
<td></td>
</tr>
</tbody>
</table>

Death Rate by Weeks of Age—Pigs from Supposedly Immune Dams of Both Classes Combined.

<table>
<thead>
<tr>
<th>Age, Number of weeks.</th>
<th>Number of pigs.</th>
<th>Results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 week.</td>
<td>7</td>
<td>No losses.</td>
</tr>
<tr>
<td>1 to 2</td>
<td>32</td>
<td>1 died; probably cholera.*</td>
</tr>
<tr>
<td>2 to 3</td>
<td>16</td>
<td>2 died; cholera.</td>
</tr>
<tr>
<td>3 to 4</td>
<td>45</td>
<td>5 died; cholera,</td>
</tr>
<tr>
<td>4 to 5</td>
<td>3</td>
<td>1 died; cholera,</td>
</tr>
<tr>
<td>5 to 6</td>
<td>4</td>
<td>None died.</td>
</tr>
<tr>
<td>6 to 7</td>
<td>4</td>
<td>All sick; 2 died.</td>
</tr>
<tr>
<td>7 to 8</td>
<td>3</td>
<td>2 sick; none died.</td>
</tr>
</tbody>
</table>

*One weakling died during the experiment which should not be counted.
*Received 15 cc. virus, 3 times the usual dose.

137
8 to 9. ......................... 6 4 died.
11 to 12. ......................... 2 Both died.
13 to 14. ......................... 1 Died.

Summary—So far our results have been quite satisfactory with pigs under five weeks of age. Apparently the younger, the better, down to one or two weeks.

An early temperature reaction with pigs given V. B. has thus far seemed to indicate good results. Retarded temperature reaction seems to indicate a tendency to develop chronic cholera.

Data 1911.*

During 1911 we gave V. B. vaccination to 183 pigs four weeks old and under, from thirty-one sows of all three classes, and lost fifteen pigs, all from two litters; nine from one sow; six from the other, in each case the entire litter.* See explanatory note concerning “Old Yellow Sow.” Twenty-nine of thirty-one sows produced pigs all of which took V. B. vaccination perfectly.

Our 1911 work is grouped as follows:

Expose Immune Sows—During the year of 1911 we vaccinated thirty pigs from five exposure immune sows and lost nine. Please note that all of these nine were from the one old sow (“Old Yellow Sow”), subsequently mentioned and explained. With this one litter excluded, there would be no losses for pigs from exposure-immune sows.

V. B. Vaccination Sows—From nine V. B. sows forty-three pigs were inoculated with no deaths. Note there were no losses in either 1910 or 1911 and none up to date among pigs from sows immunized by our V. B. method.

Dorset-Niles Sows—From seventeen sows made immune the year before by the Dorset-Niles serum-virus method we inoculated 110 pigs and lost six, of which five were from one sow and had a doubtful diagnosis. These five pigs included as having died under V. B. vaccination, were in yards of a certain city garbage feeder. Autopsy gave a questionable diagnosis of cholera. Soon after the same owner had other young nursing pigs from immune sows, sick in a very similar way—pigs that had not received vaccination, and being from immune sows, were too young to contract cholera by exposure even if the V. B. pigs previously sick had had cholera.

There is grave doubts, therefore, in this and other cases as to whether the little pigs died from cholera as result of V. B. vaccination. Pigs that died from known causes other than cholera have been excluded. All reasonably doubtful cases have been included, however, as deaths from cholera and charged to V. B. vaccination.

The showing for pigs from V. B. sows is particularly gratifying and indicates that hogs receiving this V. B. vaccination are very highly immune at the end of a year as compared with sows immunized by other processes. This is estimated by the degree of immunity possessed by their pigs at birth.

*An experiment station bulletin is being prepared for early publication. This will give methods, work done, and experimental data in full.
*One of these 15 pigs may have belonged to a third dam. We could not be absolutely certain.

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which we now believe to be a very reliable index as to the relative immunity of the dams. This is illustrated by a case previously mentioned.

In one case we had it occur that a sow produced pigs that were sufficiently susceptible to die under six weeks of age from V. B. inoculation. The sow's immunity was then reinforced by inoculation with virus. She became ill and was off feed for some days, but recovered, showing rather low immunity. Her next litter proved highly immune under V. B. vaccination.

In another case we had an old exposure immune sow ("Old Yellow Sow") which produced two successive litters of pigs which stood V. B. vaccination perfectly. A third litter was vaccinated by this method and all nine pigs died. The old sow's immunity was then reinforced and the next litter all stood V. B. vaccination perfectly. This seems to indicate that old hogs that have been at one time highly immune may be slowly losing immunity, as we would reasonably expect.

We have given some study to the question as to whether the little pigs' immunity was due to inherited immunity or whether it was receiving protection from the mother's milk. In this we had some interesting experiences which will be reported later. Our work along this line shows as far as it has gone that nursing has little to do with the pig's immunity.

In the course of this work we have had various interesting side experiments; e.g., sow 202, weighing about forty-five pounds, was treated with a large dose (115 c. c. serum) from little pigs one and one-half days old from an immune sow. At the same time she received 2 c. c. of highly virulent virus. Sow 202 was one of a carefully selected lot of pigs purchased for our regular serum testing and was presumably susceptible. She remained in perfect health. Her vaccination was given on August 12, 1910. On July 15, 1911, we inoculated six pigs four weeks old from this sow with 34 c. c. of highly virulent serum, with the result that the pigs all took this V. B. vaccination perfectly, showing not only a high degree of immunity for themselves, but also a high degree of immunity for the dam.

We are not putting our V. B. vaccination before the profession as something settled. We are not yet advising general use even where exposure immune or serum-simultaneous immune sows are plentiful, as they will be in many sections of the corn belt next spring.

Future experience may show that immunity conferred by this method upon very young pigs may not be uniformly as permanent as our results up to date would seem to indicate. In that case it may only be necessary to revaccinate by this simple and inexpensive method, when the pigs reach some, as yet undetermined, age which must of course be within the immune period.

This method has not yet made good in general field trials with different strains of hogs under different climatic conditions and different systems of feeding. All that we are doing so far is reporting frankly our results in preliminary trials and saying that we are hopeful.

Possible Field of Usefulness—Our idea of this may be shown in a suggestion to the effect that there will be many places throughout the corn belt next season where exposure immune sows will be plentiful. If actual field trial on
large scale in many sections confirms the work of two years and a half as
here reported, then owners of such sows can immunize little pigs next spring
and their descendants in turn generation after generation, at an expense that
will be insignificant. The cost of ½ c. c. of virulent serum is practically
nothing.

We can hardly expect that the general run of farmers owning a few
immune sows will take the pains to continue their stock immune to cholera
even if it could be done at such insignificant expense. On the other hand,
intelligent farmers who carry a heavy investment in hogs, and breeders of
valuable pure breeds, could continue their stock immune at a trifling expense.
It seems probable that such men would do so if the virus and veterinarians to
use it were available.

If future experience confirms our expectations, then V. B. vaccination may
play a helpful part in the future control and eradication of hog cholera.

Our work in the past nearly three years has progressed to such an extent
that we now feel justified in beginning more extensive field trials and are
planning to do so at several points in the state during the coming year.

Field Trials—The writer would like to correspond with a few veterinarians
who have something of an experimental turn of mind and who are located in
sections where cholera has prevailed during the present season. We should
like to arrange for field trials of V. B. vaccination under as different condi-
tions as possible.

REPORT OF COMMITTEE ON LEGISLATION.

Gentlemen:

Your Committee on Legislation begs to submit the following report:

It is desired to call the attention of the members of this Association to a
small pamphlet recently issued and brought up to date by the Bureau of
Animal Industry, entitled “State Sanitary Requirements Governing Admission
of Live Stock.” This publication contains a digest of the various regulations
respecting state requirements for live stock entering the different states, and
may be obtained from Washington on application.

It is very encouraging to record that since the last report of this com-
mittee California, Connecticut and Georgia have enacted legislation calling for
the tuberculin testing of all dairy and breeding cattle entering these states.
while Kansas has added the requirement of a tuberculin test for registered
breeding cattle to that previously demanded for dairy cattle, and Iowa now
requires a tuberculin test of all dairy and breeding cattle instead of only
registered cattle as heretofore. This makes a total of forty-two states (not
including the District of Columbia and Hawaii) which demand the tuberculin
test as a requirement for the entrance of dairy and breeding cattle within
their border, and leaves six states only—Florida, Illinois, Nevada, Ohio,
Rhode Island and West Virginia—without such legislation.

The progress being made by the various states in obtaining laws for the
control of glanders is equally encouraging. While Montana, Oregon and
South Dakota were until lately the only states requiring the mallein test of
horses, mules and asses, other states have recently been obtaining legislation along this line. For instance, California, Iowa, Maine, Minnesota, North Dakota and Wisconsin now require the mallein test of equines coming to these states, while Utah and Wyoming demand this test only in the case of stallions and jacks. The remaining thirty-seven states make no mention of the mallein test with the exception of Arizona, which prefers that this test be included in the health certificate.

Referring to legislation in connection with hog diseases, Montana and North Dakota were originally the only states requiring that all swine brought in for exhibition purposes must be accompanied by a certificate of immunization to hog cholera. Recently Wyoming has obtained similar legislation, while Texas has done even better by demanding that all hogs for breeding or stocking purposes must be accompanied by a certificate showing them to have been immunized by the Dorset-McBride-Niles serum method. Indiana has also recently required that hogs shipped into the state for breeding purposes be accompanied by certificates showing freedom from disease and that they originated in non-infected territory.

The only recent legislation with reference to sheep disease has been enacted by Kentucky, which requires that sheep intended for purposes other than immediate slaughter shall be accompanied by a certificate showing them to have been dipped once within ten days of date of entry in either lime and sulphur or a nicotine dip.

Respectfully submitted,

JOHN R. MOHLER, Chairman.
O. E. DYSON.
M. P. RAVENEL.

REPORT OF COMMITTEE ON UNIFORM HEALTH CERTIFICATE FOR THE INTERSTATE SHIPMENT OF LIVE STOCK.

Mr. President and Members of the Association:

Your Committee on Uniform Health Certificate for the Interstate Shipment of Live Stock, appointed at the previous regular meeting of this Association at the Grand Pacific Hotel, Chicago, Ill., December 5-7, 1910, begs to report that it submitted at that meeting the following recommendation, which was adopted:

This Committee recommends to the United States Live Stock Sanitary Association that it request the Bureau of Animal Industry to formulate a uniform certificate for the interstate shipment of live stock destined to states requiring inspection, and in the case of cattle for milk production and breeding purposes destined to states requiring the tuberculin test, such certificates to be accompanied by a record of said test, issued by a qualified veterinarian regularly registered with the Bureau of Animal Industry.

Upon presentation of the matter to the Bureau of Animal Industry careful consideration was given to its various phases, and, as related to the work of the bureau and the obligation involved, it was deemed impracticable at the
present time for the bureau to undertake to supervise the inspection and testing of live stock in the different states, as would be required under the registration provision of the recommendation. Therefore, forms, including certificate, with combination tuberculin and mallein test record were prepared and issued by the bureau for use by its inspectors in connection with interstate shipments, and under date of June 1, 1911, a letter was addressed to state and territorial officials concerned, suggesting the adoption by them of the same forms, which forms, together with a copy of said letter, are herewith respectfully submitted.

S. H. WARD.
PETER F. BAHNSEN.
J. F. DE VINE.
R. W. HICKMAN, Chairman.

Adopted.

June 1, 1911.

Sir:

For your information there are inclosed copies of I. D. form 49 and I. D. form 63, tuberculin and mallein test charts and certificates, and other blank forms. These forms will in future be used by Bureau employees who make inspections and test cattle and horses for interstate movement in compliance with the laws of the state or territory to which they are destined.

Should state or territorial officials so desire there will be no objection to their adopting the same forms, provided that reference to the United States Department of Agriculture and Bureau of Animal Industry is omitted, that the title of the signing official is properly designated, and that the forms are otherwise amended to show the state or territory which adopts them. Copies of the certificates will be furnished upon request.

Very respectfully,

A. D. MELVIN, Chief of Bureau.

REPORT ON THE NOMENCLATURE OF SWINE DISEASES.

Your Committee appointed at the last meeting to revise the nomenclature of swine diseases after careful consideration respectfully present the following report:

Whereas, Hog cholera is a synonym of "swine fever" (England), Schweinepest (Germany), Peste du Porc (France), Peste del Suini (Italy), and

Whereas, The farmers in this country recognize this disease as hog cholera, and

Whereas, The disease caused by the organism heretofore known as the bacillus of hog cholera is not widespread or epizootic in character, and

Whereas, The infectious pneumonia of swine known as "swine plague" may occur as an independent disease; therefore, be it
Resolved, That the following nomenclature of swine diseases and their etiology shall be accepted, namely:

1. Hog Cholera—The name hog cholera shall be given to the infectious communicable disease of swine occurring in epizootics, caused by a filterable virus. This disease is characterized by fever, loss of appetite, rapid emaciation, ulceration of the intestinal mucosa, usually diarrhea, and ecchymoses or petechial hemorrhages in various organs and tissues, especially the kidneys and the skin on the ventral surface of the body.

2. Salmonellosis—The name Salmonellosis shall be given to the infectious disease of hogs (formerly described as hog cholera), possessing a low degree of contagiousness, caused by bacillus suipestifer (formerly bacillus cholera suis), and scarcely distinguishable from hog cholera by the symptoms and post-mortem lesions.

3. Swine Plague—The name swine plague shall be given to the infectious disease of hogs occurring sporadically and enzootically, due to bacillus suisepticus. This disease is frequently associated with hog cholera, and produces somewhat similar lesions, but with a greater tendency to pneumonia and pleuritis.

The name of the etiological factors shall be as follows:

For Hog Cholera—A filterable virus—until further information concerning it is recorded.

For Salmonellosis—Bacillus suipestifer Kruse (formerly known as bacillus cholera suis).

For Swine Plague—Bacterium suisepticus Kruse (formerly known as the bacillus of swine plague).

Respectfully submitted,

V. A. MOORE,
J. R. MOHLER,
A. T. PETERS,
M. P. RAVENEL,
M. DORSET, Committee.

December 5, 1911.

COMMITTEE REPORTS.

We, your Finance Committee, beg leave to report that we have carefully examined the accounts of the Secretary and Treasurer and find everything correct, with a balance on hand as of November 30, 1911, $723.04, including bills receivable to the amount of $382.50.

D. F. LUCKEY, Chairman.
CASSIUS WAY.

Adopted.

Report of the Committee on tick eradication was adopted as read and referred to the Bureau of Animal Industry, Washington, D. C.

RESOLUTIONS.

Resolved, That the United States Live Stock Sanitary Association again places itself on record in favor of any proper effort which will authorize the
Bureau of Animal Industry of the United States Department of Agriculture to supervise the production of all veterinary biological products.

Resolved, That the production and distribution of hog cholera serum, virulent blood and vaccines should be under the direct supervision of the proper state authorities.

Resolved, That we deem it wise to call attention to the serious importance of infectious abortion among cattle and horses and advise that more instructions on this subject to stock owners be given in agricultural colleges, farmers' institutes and the agricultural press.

Resolved, That we deem it wise to call attention to the serious importance of infectious abortion among cattle and horses and advise that more instructions on this subject to stock owners be given in agricultural colleges farmers' institutes and the agricultural press.

Resolved, That this Association place itself on record as discountenancing the action of any state which shall employ or empower any one to apply the tuberculin test officially who is not a thoroughly competent and qualified veterinarian.

Resolved, That the report of the special committee on uniform interstate shipments be accepted by this Association and the form of certificate as presented by said committee now in use by the Bureau of Animal Industry be urged by this Association for early acceptance by live stock sanitary authorities of all states, and that we adopt their form of blank for interstate shipments of stock with such changes as are necessary to comply with the regulation of the various states.

Whereas, the legislature of the State of Illinois has taken a step backward in reference to the control of tuberculosis in that all restrictions have been removed, thus permitting tuberculosis cattle to come freely into the state from without, and

Whereas, Illinois is now making no effort to control tuberculosis among cattle within the state and has removed restrictions on the importation of tuberculosis cattle from other states, thus fostering a disease-producing center which must be a constant source of danger for surrounding states.

Resolved, That we deplore most sincerely the attitude of the State of Illinois regarding the tuberculin test; and that a copy of this resolution be forwarded to every member of the state legislature and to the Governor and to any others interested.

REPORTS OF STATE BOARD, VETERINARIANS AND LIVE STOCK SANITARY BOARD.

PENNSYLVANIA.

The 1911 legislature appropriated the sum of $30,000 for the purpose of conducting investigations concerning the causes, nature, treatment and prevention of the diseases of the domestic animals of the commonwealth and especially for the investigation of tuberculosis of cattle and of improved measures planned to check or repress this disease with the object of discovering new facts, which may be applied advantageously and profitably by the owners of live stock and those engaged in the care and rearing of animals.

A closer working relationship should exist between the officials of each state who are charged with the control of diseases of domestic animals or officials of State Live Stock Sanitary Boards; also between each of these boards and the Bureau of Animal Industry. We likewise believe that by
having more uniform laws and regulations each state, as well as the federal government, would be greatly benefited. Pennsylvania is prepared to take up with officials of other states which have satisfactory laws, the question of arranging some plan whereby we can be of assistance to each other, and at the same time place our own affairs on a better working basis. This plan is especially desired in reference to handling interstate cattle for dairy or breeding purposes.

C. J. MARSHALL, State Veterinarian.

FLORIDA.

In Florida the State Board of Health has control of all communicable diseases of domestic animals and live stock.

The work of the veterinary division of the board is in the hands of Dr. Chas. F. Dawson, who has just lately been appointed to this position. The board at present has two assistant veterinarians.

The work of the veterinary division consists mainly in the prevention and control of glanders; the testing of dairy cows for tuberculosis, and the administration of hog cholera serum; and many inquiries relating to these and other allied subjects are also handled through correspondence.

The 1911 legislature authorized the State Board of Health to manufacture and distribute free of charge to the farmers of the state hog cholera serum. While the several veterinarians have been very busy with this work for the past four months, yet the serum has been purchased from commercial sources. It is contemplated that the board will next year manufacture its own serum.

There is no law at this time in the state requiring a tuberculin test certificate with breeding and dairy cattle entering the state. Neither is there any required inspection of such animals. However, the board does upon the request of consignor or consignee make such inspection or test as is desired.

If there is any further information in regard to this work that you desire I shall be glad to furnish it.

JOSEPH Y. PORTER, State Health Officer.

KANSAS.

There is but little change in the condition of affairs of the work of this department other than what is mentioned in the biennial report, with the exception of the bad form of hog cholera throughout the state this year.

J. H. MERCER.

MONTANA.

Horses.

Total number inspected, 15,155.
Destroyed account glanders, 196.
Mallein tested, 3,821.
Reacting to test, 205.
Quarantined, 470.
Examined for health certificate, 12,066.
Cattle.

Total number inspected, 11,590.
Destroyed account tuberculosis, 371.
Tuberculin tested, 5,790.
Reacting to test, 512.
Quarantined, 186.
Examined for health certificate, 5,845.

IMPORTATIONS.

Total number of persons importing stock, 1,747.
Total number of horses imported, 6,725 (mallein tested).
Total number of cattle imported, 4,417 (tuberculin tested).

M. E. KNOWLES, State Veterinarian.

REPORT OF THE PREPARATION AND DISTRIBUTION OF ANTI-HOG CHOLERA SERUM IN KENTUCKY.

The work of immunizing hogs against hog cholera by the use of Dorset-Nièes anti-hog cholera serum was begun in Kentucky with serum obtained from the Bureau of Animal Industry and the Michigan Experiment Station. Several hundred hogs were vaccinated by members of the animal husbandry department of the experiment station with excellent results.

The last session of the Kentucky legislature gave the experiment station a single appropriation of two thousand (2,000.00) dollars for the erection of buildings and for the preparation and distribution of the serum. A laboratory costing about $1,500.00 was erected and equipped. Dr. Robert Graham of Iowa was secured to prepare the serum and aid in bacteriological work of the department. Mr. L. S. Corbett and T. R. Bryant have given assistance when not engaged in other departmental work.

The first serum was ready for distribution on February 22, 1911, since which time the department has prepared thirteen thousand, four hundred and thirty (13,430) twenty (20) cubic centimeter doses, involving the consumption of one hundred thirty-three (133) cholera pigs and eighty-nine (89) hyper-immunes. All hyper-immunes have been rehyper-immunized when practical and most of the virus has been produced at the laboratory.

Since beginning the preparation of the serum at this laboratory we have ourselves inoculated one hundred forty-six (146) herds, including fifty-one hundred twenty-nine (5,129) animals, of which forty-seven hundred seven (4,707) animals survived, showing a mortality of 8.2 per cent. The serum alone method was used on ninety-three herds, including twenty-eight hundred two (2,802) animals, three hundred sixteen (316) of which died, or a mortality of eleven two-tenths (11.2 pct.) per cent.

Fifty-two (52) herds were treated by the serum simultaneous method, including twenty-three hundred twenty-seven (2,327) animals, of which one hundred ten (110) died, or a mortality of four and seven-tenths (4.7 pct.) per cent.
Besides vaccinating these animals we have supplied serum to graduate veterinarians, but records of hogs treated by them were not kept, but the results were encouraging in all herds where the disease was not far advanced. Again we have ordered serum from other stations as far as they were able to serve us on account of our inability to prepare sufficient serum for the demand in this state—in fact, we have not been able to prepare anywhere near the amount of serum desired. We are looking forward with the hope that the coming legislature in Kentucky will appropriate sufficient funds to enable us to prepare enough serum to meet the demands. E. S. GOOD, Head of Division Animal Husbandry, Kentucky Agricultural Experiment Sta.

KENTUCKY.

The State Live Stock Sanitary Board of Kentucky was created by legislative enactment March 22, 1910, for the especial purpose of ridding our state of sheep scab. The scope of the board's duties was limited to contagious diseases among animals which are not transmissible or dangerous to humans. The work of this board has therefore been directed towards the eradication of lip and leg ulceration and scabies in sheep and the prevention of Texas fever among cattle.

Co-operation in this work was requested from and granted by the Chief of the United States Bureau of Animal Industry, who placed an inspector in this state in September, 1910.

Sheep scabies was found to exist in sixty-one counties and in addition to this disease our inspectors have found forty odd flocks infected with lip and leg ulceration, foot form; or the old fashioned foot rot of sheep, the same being scattered in twenty counties. This disease gives promise of causing our sheep owners much trouble, as it is an exceedingly difficult one to eradicate without allowing pastures to remain idle for a long time.

This board promulgated August 14, 1911, "Regulations to Prevent the Spread of Splenetic Fever of Cattle in Kentucky," which requires that cattle from the federal quarantined area may only be moved into Kentucky for purposes other than immediate slaughter, during the months of January, November and December of each year, and when so moved must be accompanied by the certificate of an inspector of the Bureau of Animal Industry showing them to be free from any symptoms of Texas fever infection.

M. C. RANKIN, Chairman.
E. S. GOOD.
L. L. DORSEY.
J. L. DENT.
FRED R. BLACKBURN.

MASSACHUSETTS.

I am very proud to say that such legislation as was recommended by the Massachusetts Cattle Bureau became law during the last session of the legislature. This legislation, though not extensive, was remedial to quite a considerable degree, the principal feature of it being a bill permitting the establishing of so-called "district agents," who have since been appointed by the
Cattle Bureau and now have local supervision over the work of local inspectors of animals of the various towns and cities in their localities.

The powers and privileges of the Chief of the Cattle Bureau were extended to no little degree by another bill which requires approval by the Chief of the Cattle Bureau before local inspectors of animals may be appointed.

A bill was also introduced to more intelligently classify the work of the Cattle Bureau and the State Board of Health, relative to the inspection of meat. Under the provisions of this bill the entire supervision of the inspection of meat is now vested in the State Board of Health, which has similar powers over local inspectors of meat to those exercised by the Cattle Bureau over local inspectors of animals.

The disease of mange was added to the list of contagious diseases recognized as such under the law, and by the provisions of this act the bureau was enabled to control quite an extensive outbreak of mange, commonly known as "cow itch," in this state, which had been developed to quite alarming proportions.

A certificate of tuberculin test is required on all cattle entering the state to remain permanently for dairy or breeding purposes. Certificates of test made outside the state by veterinarians residing in other states are accepted here provided they bear the endorsement of the officials in charge of live stock in the state from which the animals are shipped, and are otherwise satisfactory. Otherwise the cattle are tested after arrival by agents of the Cattle Bureau free of expense to the owner, but at his risk.

The most serious problem which confronts the Massachusetts Cattle Bureau at the present time appears to be the control and eradication of glanders in this state. Just what legislation will be introduced along this line I am unable to state, as the bill has not as yet been drafted. I shall be very glad if an opportunity presents itself for discussion along this line at the meeting of the Association, for I am anxious to secure the benefit of the experience of all officials of live stock departments who have had the handling of this disease.

FRED FREELAND WALKER, Chief of Cattle Bureau.

UTAH.

The regulations enacted by the last legislature, January, 1911, were that all cattle for breeding and dairy purposes cannot enter the State of Utah without a tuberculin test; all horses, mules and asses must have a certificate of health from a state official; stallions and jacks must have mallein tests before they are admitted.

We are co-operating with the federal government in stamping out tuberculosis among cattle in this state and have been so doing for the past two years. We have a food and dairy department, who are endeavoring in conjunction with us and the federal inspectors to get all dairies in a perfectly sanitary condition.

Very respectfully,

A. CARRINGTON YOUNG, Inspector.
LOUISIANA.

Respecting new legislation we have nothing to report, but can confidently predict a substantial increased appropriation from the coming session of the General Assembly, as a result of the excellent work of this board throughout the state.

Anthrax—Anthrax has been extremely prevalent this year, having manifested itself in twenty-three (23) parishes, eighteen (18) of same simultaneously. From personal investigations and reports of deputized assistants, the mortality from the disease during the past year I have estimated at seven thousand five hundred (7,500) head of live stock. We hope, however, after this to have no such infection, as thorough sanitary precautions in most every instance have been carried out, such as cremation of all carcasses, vaccination of all exposed animals and revaccination early during the spring.

Hog Cholera—Hog cholera has been very prevalent in this state during the past winter and early spring, and is extremely so at this time. We have had most excellent results from our hog cholera serum manufactured at our own plant under the supervision of this board and the writer. During the past year we have distributed approximately ten thousand (10,000) doses of anti-cholera serum with the results, where we and our assistants have administered same, being approximately ninety per cent.

Glanders—Seventeen outbreaks of glanders have been reported and investigated by this board during the past year, each instance infection being due to chronic cases in the vicinity. The total number of animals destroyed as the result of the mallein test and upon physical examination being seventy-five (75) head.

Spinal Meningitis—Outbreaks of this disease were reported from five parishes, the majority of these animals having received damaged corn and hay.

Symptomatic Anthrax—Outbreaks of this disease were reported from fifteen parishes of the state, and in each instance immediate vaccination resorted to, with the result that the mortality was not very heavy. This result, we feel sure is due to advice from this board to all live stock owners throughout the state concerning the nature of this disease and the proper methods adopted to control and eradicate same.

The importation of all live stock into this state must be accompanied by a certificate of inspection given by a qualified, graduated veterinarian endorsed by the state veterinarian of the state in which shipment originates, or certificate given by an Animal Industry Inspector, at least twenty-four hours before such shipment of live stock is shipped. Additionally, we require that all cattle shipped into this state for breeding and dairy purposes be accompanied by a tuberculin test chart, showing that they are free from tuberculosis.

E. PEGRAM FLOWER, D.D. S., Secretary and Executive Officer.

ARKANSAS.

I am glad to report that by exciting the swine breeders of the state to their interest, caused through them the passage of an act by the last session
of the state legislature for the manufacture of anti-hog cholera serum. This act carries with it an appropriation of $2,000 and authorizes the experiment station veterinarian to supervise the manufacture of this serum and sell same and all instruments necessary for its administration at cost to the breeders and farmers of the state. This act also provides for free transportation of the veterinarian over all the railroads of the state in the performance of his duties in eradicating hog cholera. This new legislation came in a very opportune time, since the entire state has been visited by a general outbreak of hog cholera, the department having furnished some sixty farms with serum.

We have no complaints to make at present of the conditions of the live stock sanitary control of the state.

We have a law and regulation requiring the tuberculin test certificate for breeding and dairy cattle entering the state, and a new regulation requiring a health certificate for all horses, mules and asses entering the state, but the mallein test is not required. Glanders is not so prevalent in the state at present as in the past few years. This perhaps is accounted for by the regulation requiring a health certificate for horses.

The veterinarian and his assistant tested 2,000 head of dairy cattle in the state and found only two reactors which proved on post-mortem examination to be tuberculous. This testing was done in compliance with the ordinance of the City of Memphis, Tenn.

The veterinary department has co-operated with the Bureau of Animal Industry in tick eradication work. Efficient work has been carried on in several counties of the state during the past year in co-operation with Dr. A. E. Wight, bureau veterinarian, in charge of tick eradication in Arkansas.

J. E. STANFORD, Veterinarian.

NEW YORK

No legislation of importance has been enacted in this state governing the movement of live stock in the past year relative to the health of cattle or other animals imported. Tuberculin tests are required for cattle intended for dairy or breeding purposes. Such tests may be made prior to or after entrance into the state. If made before shipment tests must be approved by the proper official of the state from which the shipment comes.

The practical difficulty found in enforcing sanitary regulations is lack of understanding with respect to infectious diseases by the people at large. The appraisal of animals ordered slaughtered because of glanders is provided for.

The lack of necessary funds to make prompt payment of indemnities for animals slaughtered results in dissatisfaction, for which the department is held responsible, although it is beyond our power to alter the matter, since the appropriations are dependent upon legislative action. Statistics will be available shortly indicating the number of animals tested in this state and under department supervision and the number of reactors found, etc. This data is not complete as yet, but we expect that it will be on or before December 1.

Yours truly,
J. G. WILLS, Chief Veterinarian.
ARIZONA.

The territory is practically free from all contagious diseases affecting live stock and has been free from Texas fever, cattle scabies and glanders for several years past, with the exception that we have one small range adjoining the Mexican line which, though usually free from fever ticks, is so closely allied with infection south of the international line that we hold it in quarantine.

As regards sheep scabies, the territory is practically free from same, though we have a general dipping of sheep each fall before moving the herds from the mountains to the valleys.

Regarding tuberculosis among cattle, though we have no law requiring a general testing with tuberculin of this state of stock, yet numerous herds are tested from time to time and the results are such that we are satisfied there is less than one per cent of tubercular infection in our dairy herds.

For fifteen years past the quarantine rules of the territory have required that all live stock entering the territory be accompanied by certificates of health and shipments are reported to the territorial veterinarian before entering the territory and receive his authority for admission. In this way we are familiar with the points of origin of stock entering Arizona, destination in territory and certificates issued for same.

During recent years we have required tuberculin test certificates to accompany all dairy cattle entering the territory and have preferred it for breeding cattle, though we do not enforce this rule rigidly for young bulls shipped here for range purposes when they originate in the western states.

The only suggestion I have to make regarding health certificates is that I think various state sanitary authorities should have an understanding among themselves that certificates issued by a veterinarian authorized or approved by the state authorities should be accepted, not only by the said authorities at destination of shipment, but these certificates should warrant the shippers movement through states en route without unnecessary delays, and if the shipments were inspected en route, the shipper of the stock should be placed at no additional expense. I make this suggestion because frequently after notifying shippers in the East regarding securing health certificates they have reported on arrival that they had been detained en route by various inspections, etc. We believe in a strict enforcement of the law and, as stated above, require health certificates for all classes of live stock, yet consider that we should accept the statements of authorized veterinarians from other states and not make our laws obnoxious to shippers.

Very respectfully yours,

J. C. NORTON, Territorial Veterinarian.

MICHIGAN.

The past year has given Michigan a stallion registration law. This act makes the state veterinary board for registering practitioners the stallion
registry board. The law is only a move in the right direction, and does little more than to examine the records and register pedigreed stallions.

The condition of live stock sanitary control work has not changed in any radical way during the year. As is known, the Live Stock Sanitary Commission administers the funds and directs the work which is done either by the commission directly or by the state veterinarian or other veterinarians under the commission's direction. The state veterinarian as well as members of the commission are appointed by the Governor, therefore there is always a possibility of the evils attendant upon politically appointed positions. Experience has shown that Michigan has suffered more negatively than positively by her arrangement. The personnel of the commission has generally been and certainly is now of a high standard. We have had very creditable representatives as state veterinarians in past years. Recently the state work has been done by a number of veterinarians. The plan now seems to be to have the office located at the agricultural college, partly to secure greater efficiency for the service and partly to assist in the work of the veterinary school recently established by the State Board of Agriculture. The present incumbent is on the staff of the laboratory of bacteriology, pathology and hygiene.

The commission has proven its strength in a crisis by its manner of handling the recent outbreak of foot-and-mouth disease. The commission has absolute authority to quarantine and destroy, but exercises its authority very discretely and rarely has trouble in enforcing its regulations. That its operations are not very extensive, however, can be seen from the fact that the expenses for all the work do not as a rule exceed $5,000.00 annually.

There is no direct appropriations for the work of the commission, the expenses being met out of the general fund. Perhaps it would be better to have a definite sum set aside for the pursuance of a fixed policy as regards such diseases as tuberculosis and hog cholera. The financial condition of the state makes this doubtful of attainment, and it is debatable whether it is wise The commission believes that the state veterinarian should be a highly qualified man on a salary commensurate with the demands made upon him and free from political influences. There is no doubt that improvement could be secured in our service by a hearty co-operation on the part of the veterinarians, the live stock men (including the commission) and the agricultural college.

We have a state law demanding a tuberculin test of all cattle shipped into the state for dairy or breeding purposes. Importation of horses does not require a mallein test. In commenting upon these regulations, I may say that enforcement is not rigid, the reason being either ignorance on the part of the shipper or carriers' agent or willful evasion of the law on the part of both.

Hog cholera serum is dispensed from the laboratory of bacteriology at cost; and is sent either to veterinarians or to owners of pigs. The demand for serum has increased greatly this year. We are destroying a few tuberculous cattle, and the plan outlined before this Association last year by Dr. Marshall is proving satisfactory. I refer to the instructing of agricultural students how to apply the tuberculin test and concerning the nature and importance of tuberculosis.

WARD GILTNER, State Veterinarian of Michigan.
WYOMING.

Livestock sanitary control work in this state is at present in splendid condition, although there were two specific outbreaks of glanders recently, both confined to the premises on which they were discovered as a result of the rigid quarantine enforced.

The chief difficulties this office has to contend with in enforcing regulations is lack of co-operation on the part of the county authorities, due primarily to local sentiment because of the small population of the state.

Very truly yours,


SOUTH DAKOTA.

The efforts of the Sanitary Board in this state have been directed chiefly toward the eradication of glanders. In the farming section of the state or that portion lying east of the Missouri River glanders have been quite prevalent, and is still giving us a great deal of annoyance. The mallein test has been used very extensively for diagnostic purposes, and for the past year we destroyed reactors. The disease exists to a slight extent in the arid portion or the western half of the state. The disease in this dry section assumes a very chronic type, and we often find cases in this section where the history of the case goes to show that the animal had been infected for years, and still no grave lesions of the disease manifesting itself. The state provides an indemnity for horses destroyed for glanders under the following conditions:

The indemnity must not exceed $50.00.

The infected animal must have been in the state for a period of one year prior to date of destruction.

The appointment for this indemnity was made at the last session of the legislature, and the amount fixed was $15,000. This amount will be inadequate, as present indications are that there will be at least 350 or 400 horses destroyed for glanders in this state this year. Last year ending July 1, 435 horses were destroyed on account of glanders in this state.

The state has never made any provision toward the eradication of tuberculosis. We do considerable work along this line, however, where owners of dairy herds have reasons to believe that the disease exists in their herd, the state tests their herds after having an understanding with owners that all reactors be destroyed. The state provides no indemnity for animals destroyed for tuberculosis. We have an abattoir where federal inspection is maintained at Sioux Falls, and where reacting animals are occasionally slaughtered under federal supervision. The state authorities tag or brand "reactors, TB," before shipment to abattoir.

Hog Cholera.

Outbreaks of this disease were reported from counties in the southeastern part of the state during the past summer and early fall. Immunizing serums
were used and proved most satisfactory. Very little loss occurring after the serum was used, and in this connection I wish to say that since the establishment of a laboratory at Brookings, where the serum is obtained, the hog raisers have used it very extensively, and, therefore, we have practically no loss from this malady.

Little or no change was made in our sanitary law at the last session of the legislature. The board endeavored to incorporate in the law, the regulations made by the board and failed. These regulations principally covered the requirements of dairy and breeding cattle entering the state, wherein the regulations provided that all cattle intended for breeding or dairy purposes must be provided with a certificate of health, including the tuberculin test, and all horses, mules and asses imported into the state must be accompanied by a certificate of health including the mallein test.

THOS. H. HICKS, State Veterinarian for South Dakota.

NORTH DAKOTA.

The laws of the State of North Dakota pertaining to live stock sanitary control work received some valuable additions during the legislative session of 1910.

A law was passed regulating the admission of live stock, requiring horses, mules and asses; cattle, sheep and swine, to be accompanied by health certificate indicating that said animals are free from communicable disease. In the instance of horses, mules and asses, they must have passed the mallein test, indicating freedom from glanders. Breeding and dairying cattle over six months old must have passed the tuberculin test, indicating freedom from tuberculosis. Swine for exhibition purposes must be immunized with the Dorset-McBride-Niles hog cholera hyper-immune serum.

In this connection, although copies of this law have been sent to sanitary officers in every state in the Union, it is disappointing to find the indifference given by some states in aiding in its enforcement. I might also state we have evidence of dishonesty in the issuance of certificates from some of the states.

To control this condition in this state a law was passed making it a misdemeanor for any person to issue a health certificate for live stock unless authorized by the Live Stock Sanitary Board.

In the event of dishonesty by an authorized veterinarian being discovered, his authorization is immediately withdrawn and he is subject to prosecution if he issues any more health certificates.

A law was passed to give state assistance to owners and indemnity for cattle destroyed for tuberculosis. This law was drawn along the lines recommended by the International Commission on Bovine Tuberculosis, and provides for an agreement between the owner and the state, and while not a radical measure paves the way for the co-operation of stock owners with more rigid legislation to follow.

Laws were also passed providing for fractions of a mill tax to create permanent funds for the indemnity of animals destroyed for glanders and tuberculosis, creating annual funds of approximately $40,000.
We have little difficulty enforcing our laws and regulations within the state, but we have received some disappointment in the result of our law to prevent disease being imported into the state, principally due to discreditable inspections.

It is my opinion that some of the states will be discredited by the Board, and a re-inspection required unless made by an inspector of the United States Bureau of Animal Husbandry.

Yours respectfully,

W. F. CREWE.

SOUTH CAROLINA.

I am glad to say that our work is in far better condition than it has been before. While no new legislation or regulations have come into force during the past year, we have been given an additional assistant veterinarian and have thus been able to better systematize our work. Through the kindness of Mr. Bradford Knapp of the United States Department of Agriculture we were also enabled to get in closer touch with conditions in every county in the state, his agents acting as representatives of this office and furnishing us with prompt reports of outbreaks of contagious diseases.

Our progress in tick eradication has also been as satisfactory as could be expected under existing laws. While our laws give no authority to disinfect or to compel the disinfection of tick infested cattle, we have succeeded in getting six more counties in condition for release from federal quarantine this year. We expect additional legislation, at the next session of the General Assembly, which will compel the disinfection of tick infested cattle, and this will greatly aid in tick eradication in South Carolina.

Our state laws require health certificates for all animals (except for immediate slaughter) and the tuberculin testing of breeding and dairy cattle over six months of age. Feeling the need of a uniform method of authorizing veterinary inspectors in the various states as well as a uniform health certificate for interstate shipment of live stock, the Live Stock Sanitary officers of those states east of the Mississippi and south of the Ohio Rivers at a meeting of the Southern Association of Agricultural Workers, recently held at Nashville, prepared a special form of health certificate, which was adopted, to go in effect January 1, 1912, provided a more suitable form of health certificate was not adopted by the United States Live Stock Association in December.

Very truly yours,

M. RAY POWERS, State Veterinarian.

OREGON.

Oregon has made no progress with respect to new legislation governing live stock sanitation. There was passed by the last legislature a bill providing for the indemnifying of dairy cattle owners, whose animals were killed or ordered killed because of their reacting to the tuberculin test. The measure was quite wide in its scope and did not carry compulsion excepting where
animals showed clinical lesions before the test. It sought to develop cooperative measures and gave quite a wide latitude to the owner in disposing of his reactors. The bill carried unfortunately an appropriation of $50,000 for the carrying into effect of the act, which being a great increase over former appropriations, and no doubt because of requests of many owners who were fearful that the measure was a compulsory test, the Governor vetoed the bill. We were in possession of a very creditable non-compulsory and non-indemnifying measure, and hence the same is still in effect. Oregon has suffered a slight relapse in enthusiasm as regards the tuberculin testing of animals as a whole, because of the lack of indemnity money. The state still does considerable co-operative testing, which is largely performed by federal veterinarians working in co-operation with the state officials. The City of Portland, through a milk ordinance, enforces a city tuberculin test upon all dairymen supplying milk to the city. As the state is largely concerned in the Portland milk supply, it in reality causes a considerable number of animals to be submitted to the tuberculin test. There has been something more than six thousand animals tested this last year, with a trifle more than eight per cent reacting to the test. The pure blood herds of the state with the exception of three or four herds are now all tested and practically freed from tuberculosis. This has been done largely by federal inspectors through co-operative agreements and the efficiency of the tuberculin test is highly regarded by practically all pure blood breeders. The chief difficulty in handling the tuberculosis situation lies with the city dairy owner or commercial raw milk dairy. There is no indemnity money and the dairyman cannot see the wisdom of testing his animals and buying other animals to replace the reactors, which will if they have not been before exposed to tuberculosis and received an anaphalax, probably receive an infection from other animals or from the improperly disinfected stable. Another chief obstacle seems to lie with not being able to enforce the proper disinfection of stables. This is not altogether the fault of the owner, for the average inspector takes much less interest in stable disinfection than he does in testing the animals. Unless the dairyman is a man of more than average agricultural intelligence he will allow his stable to go improperly disinfected if at all.

In glanders of horses the state has in its arid section a most insidious disease to deal with. The course of glanders here in the arid sections of Oregon becomes exceedingly chronic and because of its apparent inconsequential effects it is not regarded as a dangerous malady and many owners are ignorant of the nature of their animals' ailment. The disease is being rapidly controlled, through a system of quarantine and the destruction of visibly affected and clinical reactors.

Rabies, for the first time within the history of the state has been diagnosed, both by the finding of Nigri bodies and by animal inoculation. The disease was first reported in coyotes in the extreme Northwest portion of the state and has been diagnosed in cattle, horses, sheep, hogs and dogs. The country in which the infection was introduced is very rough and numerous obstacles are present to make sanitary control work along this line an extraordinary task. The county is almost completely surrounded by natural barriers in the form of snow-capped mountains and because of the sparseness of settlement the disease has not spread to any considerable extent. Expert hunters have been working continuously in an attempt to eradicate the
coyotes, which, of course, unlike dogs, could not be restrained. Two parties were bitten, one by a rabid coyote and one by a rabid sheep dog. Both were given the anti-rabic virus prepared by the marine hospital and have shown no ill effects.

Johne's disease has appeared on two occasions, both outbreaks were confined to small herds and were traceable to imported animals from the Jersey Islands. It seems if there is any form of a reliable test for this troublesome ailment that the federal government should exhaust its inspectors' efforts at the quarantine station. Ample time should be available for making numerous examination of rectal scrapings.

Cattle scabies has made its first important and official appearance. Animals in the interior of the state have received an infection through apparently the importation of bulls from some of the infected districts of Nebraska. Two counties will be dipped and it is hoped that with an abundance of green feed and a mild winter that the disease will be controlled.

Additional legislation in Oregon desired is a fund for the indemnifying of owners having their animals destroyed because of their being infected with an incurable infectious disease. The law should be so drawn that an owner, in order to receive indemnity, would have to thoroughly disinfect his premises, submit to a second and future tests if necessary. An ante-sale tuberculin test requirement is needed. Co-operation alone is the only method that ever will eradicate animal diseases.

We have in Oregon a tuberculin test requirement for all animals, other than strictly range cattle, imported into the state.

Sheep scab has been practically eradicated from the state and the federal quarantine has been lifted some two years ago. The sanitary work along this line is the best evidence of the success of co-operation.

Very respectfully yours,

W. H. Lytle, State Veterinarian and Sheep Inspector.

TEXAS.

Relative to new legislation, we have nothing to report excepting an increase in the appropriation for livestock sanitary work. We had a bill in the last legislature which would have given much more additional power to the Live Stock Sanitary Commission and rendered prosecution of violations a much easier matter, but the bill was killed.

The chief work of the commission this year has been tick and scab eradication, twenty-six (26) inspectors being employed in this work, not including the assistance rendered by the efficient workers of the Bureau of Animal Industry now in the state.

The tick eradication will be dealt with in the report of the Chairman of the Live Stock Sanitary Commission.

While we have little tuberculosis among cattle outside of some of the dairies of our cities, yet we have no legislation on the matter and are therefore powerless to handle it.

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Glanders, rabies and equine infectious animals are increasing.

We have had our usual virulent outbreak of anthrax in the Southeastern part of the state. A promising system of campaign of education which will be inaugurated early in the coming year will, we hope, be a long step toward controlling the disease in the future.

We have had some severe outbreaks of hog cholera, but closing the Stocker hog division of the Fort Worth Stock Yards has saved us a much heavier loss throughout the state.

One case of hemorrhagic septicaemia in a steer was found in one of the Fort Worth packing plants, but it was impossible to trace the animal up.

Our regulations call for the tuberculin test of all breeding and dairy cattle before entering the state; also health certificate in horses and mules.

We need legislation conferring more power to the Live Stock Sanitary Commission, by which violators of the quarantine regulations may be vigorously prosecuted and punished.

We also need special legislation on tuberculosis.

E. R. FORBES, State Veterinarian.

WASHINGTON.

In the State of Washington no new legislation or regulations have come into force. The live stock sanitary control work is practically on the same basis as during the past two years.

We do not have any difficulty to speak of to enforce our regulations. Our chief difficulty is in securing sufficient funds from the state legislature to carry on the work which the growing condition of the live stock industry in the state demands. The additional legislation which is desirable is larger appropriations for carrying on the work, legislation looking toward the tuberculin testing of all animals and the establishing of a farm for the erection of a laboratory to manufacture hog cholera serum.

Very truly yours,

S. B. NELSON.

NEBRASKA.

The last legislature passed a law which provides for an annual inspection of stallions and jacks. The Stallion Registration Board is composed of the Secretary of Agriculture, the head professor of animal husbandry and the state veterinarian.

The legislature also passed a law appropriating $25,000 for the purpose of indemnifying owners of horses destroyed by the state veterinarian on account of being affected with glanders.

An appropriation of $15,000 was made to carry on the manufacture of hog cholera serum.
This state requires a physical examination and health certificate for the admission of horses, and a physical examination and a health certificate accompanied by a certificate of a tuberculin test of cattle for breeding or dairy purposes.

The state keeps one man at the Omaha Stock Yards all the time to assist in testing cattle for tuberculosis.

This department is co-operating with the federal government in the control and eradication of scabies in the Western part of the state. At the present time we are also co-operating with the United States Government in the eradication of glanders on the Omaha-Winnebago Indian Reservation in Nebraska.

I believe that all the neighboring states should adopt the same law as we have in regard to glanders, so as to prevent the possibility of making our state a dumping ground for glandered horses from the other states.

The regulations for interstate shipments should be made uniform for all the Middle and Western States.

The mallein and tuberculin testing for interstate shipments by the local veterinarian will, in my opinion, not always accomplish the object for which it was intended, but is made as a compromising affair between the owner and the veterinarian and the real object is clear out of sight. This I believe is true in some instances in Nebraska, but not more so than in our neighboring states. The chief difficulties in enforcing our regulations are the smuggling of diseased live stock across the state line and the Missouri River bridges. If some provisions could be made so as to prevent this it would certainly be appreciated by this state.

Respectfully yours,

A. BOSTROM, State Veterinarian.

ALABAMA.

The live stock sanitary work of Alabama during the past year has employed most of the available funds towards cattle tick eradication. Some counties have made good progress and many premises have been released from quarantine. The Bureau of Animal Industry and the state have made special regulations by which tick free cattle in counties where tick eradication is in progress and where the cattle have been regularly dipped every two weeks for three months can be dipped in a special vat under the supervision of a live stock inspector and dipped again at the railroad shipping point and then be shipped into the tick free area of the United States.

Hog cholera has been very widely distributed over the state during the past year. This is due to the facts that the hog industry is growing very rapidly and farmers are shipping into Alabama many breeding hogs, and also the sales and interchanges of Alabama bred hogs have been larger than usual. Moreover, another reason for the prevalence of hog cholera is that the Live Stock Sanitary Board has not had funds sufficient for making hog cholera serum. Hence, little serum has been used in the state.
Very little new legislation along livestock sanitary lines has been enacted this year. One new law was enacted. It provides that dairy cattle that react to tuberculin when sent to slaughter by city inspectors shall be paid for by the city when no tuberculous lesion can be found at the post-mortem inspection.

The great need of the Alabama Live Stock Sanitary Board is more funds, for

(a) Tick eradication work.

(b) Making hog cholera serum.

(c) Controlling and eradicating tuberculosis.

(d) Investigating, inspecting, controlling and eliminating glanders, hemorrhagic septicemia and other infectious diseases.

The state laws and regulations of the Live Stock Sanitary Board require a health certificate made out by a legally qualified veterinarian for all horses, mules, sheep, hogs and cattle shipped into Alabama for all purposes other than immediate slaughter.

All breeding cattle must be tuberculin tested and the temperature records sent to the state veterinarian. Feeders may be shipped into Alabama for feeding or slaughtering on an affidavit of the owner that they will be fed separated from all breeding cattle and the owner will account for the disposal of all the feeders as slaughter animals.

C. A. CARY, Sec. Live Stock Sanitary Board and State Veterinarian.

NORTH CAROLINA.

The sanitary control work of North Carolina is done by the veterinary division of the Department of Agriculture. The Sanitary Control Committee is composed of the Commissioner of Agriculture, ex-officio, chairman, and five members of the Board of Agriculture. This board meets semi-annually—June 1 and December 1, at which meeting appropriations are made and regulations adopted for the conduct of the work. For the year 1911 the total appropriation amounted to $22,000, and from this the salaries of three veterinarians, three dairymen, clerk, all traveling expenses and salaries of five cattle inspectors engaged in tick eradication. Our sanitary control work is divided into the following heads: Tick eradication, tuberculosis and hog cholera serum.

**Tick Eradication**—The work of tick eradication requires the entire time of five men. For this work the appropriation for 1911 amounted to $8,000. This work is done in co-operation with the B. A. I. During this year the bureau has supplied us with ten men. We have been able during the season to eradicate the ticks from four counties, comprising 1,981 square miles. These four counties are free from ticks and have been recommended to our board for release December 1.

We have now eradicated ticks from fifty-nine of our hundred counties. The work in the future will probably move along with more speed than during
the past from the fact that our methods have been improved by the experience of the past and many valuable suggestions from others engaged in the work in other sections.

From our Auditor's report we notice that the value of cattle in the free territory is thirty-five per cent greater than that of cattle in the ticky territory, which is very conclusive evidence of the benefit of the work.

**Tuberculosis**—In testing cattle for tuberculosis we have started a campaign with all state institutions which have cattle under their control—orphan asylums, penitentiary, county homes, schools and colleges.

The work this year shows that we now have in the state only 1.5 per cent of our animals infected with tuberculosis. One very important fact has been shown by our work, and that is, that the cattle which are imported from other states have been the source of our infection. In fact, our test shows that as high as sixty per cent of the animals brought into our state for dairy and breeding purposes have reacted to the test. Our regulations now require that all cattle over six months old coming into the state for dairy or breeding purposes must be tuberculin tested, also given a physical examination. The report of the veterinarian making the test and the temperature chart must be endorsed by the state sanitary officer of the state in which the shipment originates, then submitted to the state veterinarian of North Carolina and approved by him before the shipment is permitted to enter the State of North Carolina. This state does not reimburse owners for diseased animals.

**Hog Cholera Serum**—For this work we have an appropriation of $1,500. We have been able to make all the serum necessary to supply the demand.

Respectfully submitted,

W. G. CHRISMAN, State Veterinarian.

**INDIANA.**

This state requires that all breeding and dairy cattle shipped into the state must be tuberculin tested and found free from disease and tagged with the Indiana state tag by the state veterinarian or a federal employee in the state from where shipped and the record of the test sent to this office to be filed or a permit be secured from this office to have such animals shipped into the state and to have them tested on arrival by a man sent from this office at the owner's expense. Animals to be tagged with the Indiana state tag and no indemnity for reactors. No restrictions on the shipping in of other classes of stock except swine which come from public stock yards, as all public stock yards are taken as infected territory. Swine, however, may be shipped in for immediate slaughter. The Governor has the right to order a quarantine against any outside territory for any communicable disease, when it is brought to his notice that such disease, from such territory is dangerous to the welfare of the stock interests of this state.

The last legislature provided a fund of $5,000 a year for the eradication of sheep scab and at the same time changed the law on tuberculosis on native cattle, making it practically impossible to do anything with tubercular native
cattle. The law now requires that the tuberculin test shall not be a definite diagnostic agent on native cattle, but that the animals must also show physical symptoms, and which physical symptoms must be discernible to two free holders in the township in which the animal is owned. However, if the animal reacts to the tuberculin test it can be quarantined, prohibiting the use of same for breeding or dairy purposes. The quarantine would be effective did we have means of enforcing the quarantine, which we have not and which to those familiar with the practical workings, will appear apparent, as it would require a man stationed at point of quarantine all the time for each animal. So far we have found but little difficulty in enforing regulations, except a lack of men to do the amount of work that should be done in this state. It would be impossible for me to give an intelligent idea of what the prospects would be in the future for securing any additional needed legislation.

Very truly yours,

W. E. COOVER, State Veterinarian.
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1911 AND 1912.

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Ryan, Dr. John T., Chicago, Ill.
Roberts, Dr. G. H., Indianapolis, Ind.
Reichel, Dr. John, Glenolden, Pa.
Russell, Mr. T. F., Pana, Ill.
Ransom, Dr. B. H., Washington, D. C.
Ramsay, Dr. R. A., Washington, D. C.
Rives, Dr. Robert, National Stock Yards, Illinois.
Ravenel, Dr. M. P., Madison, Wis.
Reynolds, Dr. M. H., St. Anthony Park, Minnesota.
Sullivan, Dr. W. A., Chicago, Ill.
Stringer, Dr. N. I., Paxton, Ill.
Spiller, Mr. E. B., Fort Worth, Tex.
Schumacher, Dr. Wm., Durango, Colo.
Steddom, Dr. R. P., Washington, D. C.
Schoenleber, Dr. F. S., Manhattan, Kansas.
Stanford, Dr. J. F., Fayetteville, Ark.
Schroeder, Dr. J. F., Bethesda, Md.
Smith, Dr. Clarence E., Greenville, S. C.
MacKellar, Dr. Wm. M., Los Angeles, California.
Turner, Mr. Avery, Amarillo, Tex.
Treacy, Dr. R. H., Bismarck, N. D.
Van Es, Dr. L., Agricultural College, North Dakota.
Ward, Dr. S. H., St. Paul, Minn.
Walker, Mr. Fred F., Boston, Mass.
Way, Dr. Cassius, Harvard, Ill.
Wells, Dr. T. G., Arthur, Ill.
Whittington, Dr. C. A., Niles, Ill.
Wight, Dr. A. E., Little Rock, Ark.
Wilson, Dr. R. H., Detroit, Mich.
Wright, Dr. J. M., Chicago, Ill.
Waddell, Mr. W. N., Fort Worth, Tex.
Wood, Dr. E. F., Raleigh, N. C.
White, Dr. Henry A., Wyoming, Ill.
Whiting, Mr. Rex A., Lafayette, Ind.
Wylie, Hon. George, Morrisonville, Wis.
APPENDIX

SERUM DIAGNOSIS OF GLANDERS AND OTHER ANIMAL DISEASES.

By John R. Mohler, V. M. D., Washington, D. C.

In typical or advanced cases of glanders the disease can be definitely diagnosed by physical examination alone. And we are liable not to rely sufficiently on our powers of observation and differentiation in the diagnosis of this disease at the present day when biological tests are so easily made and laboratories are so much in evidence. The great drawback to physical examination alone is that a large percentage of the cases are not typical, and the so-called occult or latent cases do not show any physical signs. It is nevertheless absolutely essential to pick out these cases if the disease is to be suppressed. It is only too true that the present prevalence of glanders throughout the United States is mainly due to the fact that sufficient effort has not been put forth to get the occult or “contact” animal. We are too liable to content ourselves with the destruction of the more or less marked cases and leave the remaining animals free from quarantine, only to see them break down with the disease at some later date, and in the intervening period spread the infection to a greater or less degree.

Mallein Reaction.

The first important step toward determining obscure and latent cases of glanders was made by the discovery of mallein. This product was discovered by Kelning, a Russian veterinarian, in 1890. Extensive experiments by Nocard of France and McFadyean of England confirmed the valuable character of this diagnostic agent.

In America the most extensive work with malleination has been done by J. G. Rutherford of Canada. The Canadian Department of Agriculture is making successful efforts to eradicate glanders from the Dominion, and since March, 1905, they have adopted the policy of compensation and slaughter of all animals which react to mallein, whether they are showing symptoms of the disease or not. Many veterinarians have advanced the idea that repeated malleination has a curative effect on the disease and that ceased reactors may return to work and be stabled with healthy horses without danger of transmitting the disease. These views have been disproved by numerous observations, as outbreaks of glanders have been traced directly to these ceased reactors.

There is a considerable proportion of glanderous animals in which mallein fails to give a typical reaction, and, on the contrary, a reaction may follow the injection of mallein in the absence of glanders. Thus, mallein is not an entirely reliable diagnostic agent for determining glanders, nor has it ever been considered as efficacious in the detection of this disease as tuberculin is for the diagnosis of tuberculosis. Judging the mallein test is a procedure in the successful performance of which no hard and fast rules can be laid down for adoption in all instances. In the great majority of cases definite and well-marked results are obtained. There are, however, cases in which, after carefully weighing all the points in the case, we are undetermined what course to pursue. In such cases it is best to quarantine the animals and subject them to a subsequent test by applying the complement.
fixation method. Various statistics have been gathered from different sources relative to the reliability of the mallein test in the diagnosis of glanders, and from a study of 6,870 recorded cases, mallein has been found to give satisfactory results in eighty-nine per cent of the tests applied.

When mallein gives negative reaction in animals which show no clinical indications of glanders, the test may be considered to be efficient as a rule. The greatest number of errors occur in those apparently healthy animals which give positive reactions, but which on post-mortem examination are found to harbor parasitic nodules in the liver or lungs, rather than glanders nodules.

Schütz has pointed out, and Olt has confirmed the statement, that on post-mortem examination of many cases of reactors nothing but these parasitic nodules are found, which are in fact quite innocent and very often occur in healthy horses. In the handling of those apparently normal animals it would therefore appear advisable to consider all non-reactors as healthy, while those which react should be quarantined and subjected to the more accurate complement fixation-agglutination test described below.

**Complement-Fixation Test.**

In 1909 Shutz and Schubert published the results of their important work on the application of the method of complement fixation for the diagnosis of glanders. And since their experiments were followed by splendid results, exceeding by far the results obtained from either the mallein or agglutination test, they recommended that this method of diagnosis in combination with the agglutination test be taken as the official test in Germany. This method, overcoming as it does the disadvantages of the mallein and agglutination tests, constitutes without doubt the most reliable method for the diagnosis of glanders which we have at our command at the present time. The complement-fixation test is, in fact, the most definite method known for determining specific infections and is as nearly perfect as a biological test can be. It has recently been thoroughly studied by this bureau and has given excellent results.

Meyer has also published a recent article on the value of this test, in which he concludes that occult glanders may be more readily diagnosed by the complement-agglutination method than by the mallein test.

The principle of this test is presented in the phenomenon of hemolysis, which was first discovered and studied by Bordet and Gengou. This phenomenon consists of the well known fact that if red blood cells of one animal are introduced into another of a different species, the blood of the latter acquires the power to dissolve the blood cells of the former when mixed with them in a test tube. This reaction is termed hemolysis, which means the dissolution of blood cells, thereby setting the hemoglobin free in the medium in which the cells are suspended. To illustrate, if a rabbit is injected with washed blood cells of a sheep, the blood of the rabbit will develop specific hemolysins which possess a dissolving action for the sheep blood cells. This hemolytic property of the blood depends on two substances. One of these is present in the blood of every animal and is known as immune body, sensitizer, or hemolytic amboceptor. The former is readily destroyed by heating to fifty-six degrees C. for one-half hour, while the latter resists even higher temperatures.
After the complement has been destroyed by heating, it can be replaced by the addition of any normal serum, because it is known that the complement is present in the blood. However, the guinea pig serum seems to be the most satisfactory in the application of hemolysis, inasmuch as it is very rich in complement and only a very small quantity is required to be added to the inactivated hemolytic serum in order to produce hemolysis. This means that an opaque suspension of red blood cells is rendered semitransparent or "laked," as a result of the action of the amboceptor and complement on the stroma of the red cells which permits the escape of the red coloring matter of the cells. Accordingly, the substances necessary for hemolysis are (1) the hemolytic amboceptor, which is the serum of a rabbit that has been injected with washed sheep corpuscles; (2) the complement in the form of normal guinea pig serum; and (3) washed red blood cells of a sheep. In the preparation of these different substances it is necessary to fix standards of practical constancy, which cannot be discussed at this time, but their preparation and application are explicitly presented in B. A. I. Bulletin No. 136.

In the complement fixation test there are also used, besides the hemolytic system, the serum of the horse to be examined and an extract of glanders bacilli, termed antigen.

The complement-fixation test is so called on account of the fact that the complement is fixed by the combination of glanders bacilli extract with antibody or immune body in a glandered horse, and is thus prevented from participating in the hemolytic process in which it is essential in order for hemolysis to take place. By this method even small quantities of glanders antibodies (amoceptors) can be demonstrated in a serum.

The presence of an infectious principle in the organism of an animal or a man has a stimulating effect on the production of antibodies (immune bodies). If a serum containing such immune bodies is inactivated and brought into contact with the antigen in the presence of complement, the complement will become firmly fixed by the combined immune body and antigen. Thus, anchoring takes places between the antigen and the antibody in which the complement becomes fixed. This anchoring is thoroughly established when the mixture is placed in an incubator for one hour. The addition of the hemolytic amoceptor and blood corpuscles to such an anchored antigen and immune body will have no effect. Thus no hemolysis will take place, inasmuch as the complement has been fixed by the immune body and the antigen, thereby leaving the hemolytic system incomplete. On the other hand, if the inactivated serum contains no immune bodies, there would be no substance in the serum to anchor the antigen. As a result, therefore, no fixation of complement will occur, this being left free, and on addition of hemolytic amoceptor and blood corpuscles hemolysis will now take place. Neither the antigen nor the antibody alone can fix the complement and thereby influence hemolysis when the hemolytic amoceptor and blood corpuscles are added. However, in combination the fixation will invariably take place, and on the addition of the hemolytic amoceptor and blood corpuscles hemolysis will not be produced.

The serum of glandered horses, therefore, contains antibodies (immune bodies) against glanders bacilli, which are specific only for glanders bacilli and for no other infection. The complement fixation accordingly represents a specific test, as only in the presence of the glandorous immune bodies and
glanderous antigen will the reaction take place. If, instead of the glanderous immune bodies, other antibodies of another infectious disease be present in the blood serum, they will exert no effect whatsoever on the glanderous antigen; and, on the other hand, if serum containing glanderous immune bodies is brought in contact with an antigen of another infectious disease it will also have no effect on the reaction.

The results of the tests are manifested in most instances by a distinct reaction which takes place in the test tubes.

We may thus obtain in these tubes either complete hemolysis, incomplete hemolysis, or no hemolysis whatsoever. The fixation of the complement is manifested by the absence of hemolysis, and therefore we have a settling of the blood corpuscles with the watery clear fluid above. Such a result indicates without doubt the presence of glanders. On the other hand, if the tubes show complete hemolysis, the absence of glanders is thereby indicated. In the presence of glanders a fixation of the complement takes place, as a result of anchoring to the immune bodies and antigen, while in the absence of glanders, there being no immune bodies present, the complement is used up in the phenomenon of hemolysis.

Then, again, we may have cases in which the fixation of the complement is incomplete; that is, there is a settling of corpuscles in the bottom of the test tube, but the fluid shows traces of hemolysis. It does not show the characteristic saturated color of hemolysis, but only a tingeing with the hemoglobin. This is termed an almost complete fixation, and also indicates the presence of glanders. The presence of the characteristic color in the fluid and a very slight deposit of corpuscles on the bottom should not be taken as an indication of an infection, as such a condition may be brought on by various causes, and particularly so by the presence of nonspecific substances in the serum of the horse, which may cause a slight checking of the hemolysis. But all cases where the results show a fixation of the complement (no hemolysis) or almost complete fixation (slight tingeing of the fluid above the settled blood corpuscles) indicate the presence of glanders.

In order to reduce the possibility of error to a minimum the agglutination test may be applied to the negative cases, and if this shows a value of 1 to 1,000 or over the animal should be considered as glandered. However, such cases are extremely rare.

Since this method of diagnosis of glanders was inaugurated in this laboratory large numbers of horses and mules have been examined in the District of Columbia, as well as the blood of animals from other parts of the United States. Many of the horses examined had clinical cases of glanders, while others were selected because they were reactors to the mallein test, some typically and others atypically. A large proportion of the cases, however, were exposed or "contact" horses. From the number of tests already made—about 1,540—the results indicate that in the complement fixation we have a method which in accuracy is equal to the tuberculin test for the diagnosis of tuberculosis in cattle. The results of the tests thus far conducted show that at least ninety-seven per cent of the cases of glanderous affection can be determined by the complement-fixation method. Furthermore, the affected horses in which a negative or an atypical reaction occurs are as a rule...
either very old chronic cases of glanders, or those fresh cases of infection tested during the period of incubation. According to Hutyra and Marek the diagnosis of glanders by the complement-fixation test has already given such accurate results that it may be considered as the best method for the determination of this disease at the present time.

Among the horses tested by complement fixation there were a number of animals which gave atypical reaction to the mallein test, but on the complement-fixation test proved either absolutely positive or negative. Of these horses those which gave a positive reaction and were killed proved to be glandered. The following table shows the comparative results obtained with the mallein and complement-fixation tests:

**Comparative results with mallein and complement-fixation tests.**

<table>
<thead>
<tr>
<th>Locality</th>
<th>Positive to mallein test</th>
<th>Negative to mallein test</th>
<th>Atypical reaction to mallein test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Response to complement-</td>
<td>Response to complement-</td>
<td>Response to complement-</td>
</tr>
<tr>
<td></td>
<td>fixation test.</td>
<td>fixation test.</td>
<td>fixation test.</td>
</tr>
<tr>
<td></td>
<td>Total.</td>
<td>Total.</td>
<td>Total.</td>
</tr>
<tr>
<td></td>
<td>Nega-</td>
<td>Nega.</td>
<td>Nega.</td>
</tr>
<tr>
<td></td>
<td>tive.</td>
<td>tive.</td>
<td>tive.</td>
</tr>
<tr>
<td>California</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Canada</td>
<td>-1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Connecticut</td>
<td>9</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Florida</td>
<td>9</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Illinois</td>
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<td>4</td>
<td>2</td>
</tr>
<tr>
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<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Maine</td>
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<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Michigan</td>
<td>18</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
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<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Montana</td>
<td>35</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>Nebraska</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>North Dakota</td>
<td>19</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>Oregon</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Texas</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Washington</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Wyoming</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
<td>103</td>
<td>34</td>
</tr>
</tbody>
</table>

In the 325 cases shown in the above table, wherein the two tests are compared, the mallein test was confirmed by the complement-fixation test in 161 cases and was not confirmed in 59 cases. There were 105 atypical reactions to mallein which were definitely diagnosed by complement fixation—44 positive and 61 negative. Seven of the Maine reactors to mallein and 3 atypical reactors were examined post-mortem without showing any evidence of glanders.

In addition to the above there have been 1,218 tests made upon horses with the complement-fixation method alone, and we have also tested by this method the blood of one lion, which gave a positive reaction, and the blood
of one human suspected of having glanders, which proved negative. These two results were later substantiated.

Of the above mentioned 1,218 tests, 643 were conducted on horses at Washington, D. C., and of these 21 gave a positive reaction, all of which were subsequently confirmed on post-mortem. The remaining 575 were from miscellaneous sources, 78 of which were positive, while 497 were negative.

In order to determine whether the fixation of the complement may be obtained occasionally in normal horses or in horses affected with various diseases other than glanders, a number of tests were made with the blood of apparently normal horses, and also with horses suffering with various infections and noninfectious diseases. One of these tests was made with the blood of a horse affected with swamp fever, in which the temperature registered 106.2 degrees Fahrenheit; other tests were made with blood from horses affected with distemper, influenza, dourine, heaves, lameness, fistulous withers, forage poisoning, etc., but in all these cases negative reactions were obtained.

**Combined Complement-Fixation and Agglutination Tests.**

While the complement-fixation test is without doubt the most satisfactory single method of diagnosing glanders, and although practically all cases giving a complement fixation can be considered as glandorous infections, nevertheless there is a very small percentage of cases in which the complement fixation is not well marked, and in these instances some uncertainty may be felt regarding the final determination of the presence or absence of the disease. These particularly may be met in cases where the infection is of a very recent origin. Inasmuch as it has been established that the agglutination test gives highly satisfactory results in these early stages of glanders, the application of the combined test appears therefore very advisable. The results which were published by Miessner and Trapp regarding the value of the complement-fixation test and the combined blood test (complement fixation and agglutination) show that about 97 per cent of the cases in which complement fixation is obtained prove to be glanders. On the other hand, by the combined blood test the number of failures in healthy horses is reduced to 1.1 per cent, and in glandered horses to nothing; or, as Hutyra and Marek have stated, the combined blood test will prove accurate in 99 per cent of the tests applied.

The agglutination test as it is employed in combination with the complement-fixation test is a modification of the agglutination test which was formerly used. This consists in the incubation for one-half hour, and centrifugization for ten minutes, of the different dilutions, by which the reaction is hastened in the test tubes. The results can then be read in about two hours. A detailed description of this test will shortly be published by the bureau.

Based on the experience gained with the combined blood test, the Prussian minister of agriculture has adopted the following principles for the diagnosis of glanders by this method:

1. Horses the serum of which produces a complete fixation of the complement in the quantity of 0.1 c. c. should be considered glandered without consideration of the agglutination value.
2. Horses the serum of which gives an incomplete fixation of complement in the quantity of 0.1 c. c. or even in the quantity of 0.2 c. c. should be destroyed without consideration of the agglutination value.

3. Horses the serum of which produces no fixation of complement in quantities of 0.2 c. c. should be destroyed if their agglutination value is 1 to 1,000 or over.

4. In every stable of horses where the first blood examination reveals glanders a second series of samples should be taken on the day of killing of the affected animals. If glanders is again found, a third series of samples is taken fourteen days after the second series and following the disinfection of the premises. Should the third blood examination prove the presence of additional cases of glanders, the procedure should be repeated, as after the first examination.

5. Horses the serum of which does not produce a fixation of complement in quantities of 0.2 c. c. and the agglutination value is less than 1,000, should be considered healthy if the blood was taken at least fourteen days after the removal of the sources of infection. If the time when the sources of infection were removed cannot be positively determined, a second series of blood samples should follow the first. If the second examination of the blood shows the same result as the first, the horses should be considered healthy.

6. The blood examination of the horses in the stable should be considered as concluded when the above requirements have been carried out.

Since the discovery of the phenomenon of complement fixation it has been utilized extensively in serum diagnosis, but probably its greatest value has been obtained from the Wassermann reaction for the diagnosis of syphilis. It has also been employed in other diseases with more or less satisfaction, and its great field in bacteriological investigations has not yet been exhausted for the practical diagnosis and determination of immune bodies in serum. In veterinary practice complement fixation is now becoming quite generally used for the diagnosis of glanders. This method of diagnosing glanders has given the most favorable results in Germany, and constitutes at the present time the official test for Prussia and other parts of Germany. It has also been used in the diagnosis of other diseases of man and animals, with varying results. For instance, the reports have been favorable in the detection of leprosy, but in rabies the results have not been uniform nor promising.

Weinberg and others have recommended the complement fixation method for the recognition of infections with Cysticercus, Distomum and Echinococcus, while Strobel has found that this method may be used as a diagnostic agent in cases of trichinosis. Dedjulin has likewise proven by complement fixation that the bacillus suispestifer is not the cause of hog cholera, as the fluids from animals affected with hog cholera did not fix the complement with extracts made with the bacillus suispestifer. Before seeing this article the present writer had started some experiments attacking the other side of the problem, to prove that the filtrable virus is the cause of hog cholera, thus reversing the experiments of Dedjulin. For this purpose extracts of various tissues from typical cases of hog cholera, especially the spleen and bone marrow from which all bacilli were eliminated by the usual plating method, have been employed as antigens and the results are very encouraging.
pel and Pfeiler have recently established in a similar way that neither Schutz's diplococcus pneumoniae nor Ligniere's pasteurella can be considered as the cause of influenza of horses.

Complement fixation has not proven satisfactory in the diagnosis of animal and human tuberculosis. In the serum of man affected with tuberculosis various investigators have demonstrated tuberculosis antibodies with the complement fixation, while others obtained negative results.

Bach conducted experiments in Klimmer's Institute for the diagnosis of bovine tuberculosis by the complement fixation. In these experiments he found the method unsatisfactory, as the serum of healthy as well as affected animals gave the same results. On the other hand, Ruppel has found that horses, mules and cattle, immunized with the bacillus of tuberculosis, or with its products, invariably disclosed tuberculosis antibodies in their serum by the complement fixation test.

Pavlosevici, Schilling and Hoeslin have employed the complement fixation test in trypanosome infections with not entirely satisfactory results. McFadyean and Stockman, Holth, and others have utilized the method with good results in the diagnosis of infectious abortion.

Negre and Bridre found that in epizootic lymphangitis fixation of the complement occurs with an antigen made of an extract of Saccharomyces farciminus or other yeasts, but there is no anchoring when an extract of bacteria or protozoa is used.

Schutz and Wassermann recommend the adoption of this test in meat inspection for the purpose of distinguishing the different kinds of meat. It should be remembered, however, and this fact has been established by Uhlenhuth, Weidanz and Wedeman, that some substances used in the preservation of meat (saltpeter, spices, etc.) also cause the fixation of the complement. This fixation of the complement by the saltpeter of pickling solution was observed recently in this laboratory in examining pickled horse meat for the presence of glanders. By carefully checking the tests with the usual controls, this fact was readily ascertained. At present the bureau is using the complement fixation test in the diagnosis of swamp fever, dourine, infectious abortion, and suspected Malta fever of goats in Texas, but the work is only in the experimental stage and the results obtained will be published later.

RABIES.

By S. H. Ward.

According to the many writers who have described this disease, it is one of great antiquity. Calcus, the Roman Hippocrates, during the reign of Tiberius dwells at length on the danger of the disease. Some early writers describe rabies as the effect of an evil spirit or of witchcraft, and its signs are the dog keeps its mouth open, his saliva is constantly flowing; his ears hang down; and he "does not bark." The cure recommended was the eating of the dog's diaphragm. Again we find some of the older writers believed the disease arose spontaneously.

The Jewish law permitted the killing of mad dogs on the Sabbath because of their being dangerous. These records sufficiently indicate the antiquity of the disease.
The many obscurities which confronted the older writers have been within the past decade partly lifted; and while the present age is better enlightened there remains yet much to be done.

To Virchow belongs the credit of showing the disease was produced by the injection of saliva, and to Pasteur belongs preventive treatment. The symptoms of the disease are so well known to all present that to recapitulate them would be tedious.

In passing, it may be noted that many writers believe wild animals, such as the wolf, fox and skunk are prone to rabies. This belief is set forth by many who have acknowledged the disease can only be produced through inoculation. If these animals were commonly affected, or if, as some people declare, the bite of a skunk would produce rabies, then the western and northern section of this continent would be unsafe for man, or the ordinary farm animal. As a matter of fact, rabies was unknown to the early settlers of the north, and never appears north of the international boundary unless imported. It is apparent, if these wild animals just mentioned were dangerous that many hunters and trappers must have contracted the disease. Again, it is a common habit for all animals with padded feet to lick their paws, hence scratches produced by wild animals affected with rabies could easily inoculate those handling them.

Rabies is without exception the most difficult disease to control, due to the falacies existing in the minds of the ignorant and the false sentiments which follow muzzling orders and the compulsory slaughter of unrestrained and ownerless dogs. Immediately a muzzling order is issued champions of "man's best friend" come rapidly to the front, ably assisted by the humane society, and greater efforts are put forth to save the dog while the defenseless woman and child are left to look after themselves as best they can. It may be true the dog exhibits more affection for its master than any other domestic animal, and we frequently find owners who exhibit more affection for their dog than they do for their family. It is principally this class of human beings who object to and obstruct the passage of laws designed for the benefit of all humanity.

While many dogs have their usefulness as do all other animals, I am of the opinion that there is no dirtier domestic animal in existence than the dog. Treacherous and filthy, his name is used as a term of reproach. Roaming the streets, the dog serves the purpose of scavenger, eating food that is loathsome, doing things that disgust our senses, yet we tolerate them because of the many maudlin sentimentalists. City ordinances prohibit horses, cattle or swine from running at large, yet the dog is given its complete liberty and its dirty habits overlooked. City dogs are kept at best under abnormal conditions. Nine-tenths of them are useless.

If it is desired to keep dogs the law should impose restrictions that would at least protect the rights of the people against bodily harm and disease. Every municipality in the country levies a tax upon dogs. In the cities a tax of from one to three dollars per head is called for, yet seventy-five per cent of the dog population escapes taxation. In New York 2,500 persons were bitten during the first eight months of this year. Children were the greatest sufferers—1,800—as against 700 adults. Seven fatal cases in the
human were diagnosed. Examination of animals killed and sent to the department showed 1,912 rabid dogs. In the city just named it is estimated there are 300,000 dogs, only 50,000 of which are licensed, the remaining 250,000 being strays. This proportion of licensed dogs holds good in other cities. No attempt is made in ninety-nine per cent of the cities of the United States to enforce their dog ordinances.

To control rabies, state wide legislation is required and authority vested in a central body to rigidly enforce the killing of all dogs which have been bitten by a rabid dog, and also dogs which have come in contact with a rabid dog.

All municipalities should be required by the central authority to enforce the collection of dog taxes, and the slaughter of unlicensed dogs. Authority should be given to the central body to enforce muzzling orders on all dogs within a radius of twenty-five miles of an outbreak. Local boards of health in the quarantined district should be given the names of owners of all licensed dogs and power to enter any premises and seize and kill dogs not licensed.

The best solution of the problem is the passage of a state law along the following lines:

Require every owner or keeper of a dog three months of age and over to take out a license.

Every license to have a description of rabies printed thereon.

Each dog licensed to have a tag or collar.

Clerks of the several cities, villages and towns should issue the license and pay to their respective county treasurer the amount collected less a small percentage for fee.

Each treasurer should be required to keep a record of fees collected and paid out.

The assessor should be required when listing property for taxation to obtain the names of all owners or keepers of dogs and return the list to the clerk of the municipality. A fine should be placed on owners or keepers of dogs who refuse to answer or answer falsely.

Health officers should at a specified time issue a warrant to police officers directing them to kill all dogs which are not licensed and collared, payment of this work by officers not under regular pay should be made from the treasury out of funds collected.

County attorneys should be required to prosecute all health officers who fail to comply with the law.

Moneys received by the county treasurer should be paid to the state treasurer, one-fourth of which money should be set aside for maintaining a Pasteur institute. Treatment should be free of charge. The balance three-fourths should be placed in a fund to reimburse owners of live stock dead as a result of being bitten by rabid animals.
Health officers should be required to make such appraisals and submit same to county commissioners, who in turn could present claim to state treasurer. All moneys not used at the end of each bi-annual period to be expended on public highways.

A law embodying these suggestions would enable authorities to more promptly control the disease, as practically no stray dogs would be roaming the country. Rabid dogs killed at a distance from home could be traced by their license tag.

The annual loss of live stock from rabid or vicious dogs will total over a million dollars annually. For these losses I am not aware there are as yet in any state laws that will permit recovery for loss or compensation.

It is true action might be started against the owner of a rabid dog which has bitten live stock. The difficulties arising are so many as to preclude any prospect of recovery. In the first place, owner of the rabid dog may have no financial standing. Again, the burden of proof that the dog which caused the damage was actually affected with rabies would rest on the plaintiff, and unless it could be shown such dog had been killed directly after inflicting the damage and a positive diagnosis of rabies made from the brain, the possibilities for recovery would be slight.

Hence a law which would place the burden of the damage caused by rabid dogs on all owners of dogs along the lines suggested is in my opinion needed if protection of personal property and against bodily injury is to be afforded the people.

**CONTROL OF GLANDERS IN MINNESOTA.**

By Charles E. Cotton, V. M. D.

In presenting this subject to you at this time I shall not present anything new, but wish to show the fallacy and usefulness of undertaking to control this disease except by destroying all clinical cases, all reactors and retesting all contact horses and destroying the reacting ones.

In the early nineties little or nothing was done toward controlling glanders in our state except in the cities, where the few graduated veterinarians were located, and then only the clinical cases were destroyed. Unqualified men were numerous and their knowledge very slight, but the majority of them had sufficient knowledge of the disease and were unscrupulous enough to advise the owner to get rid of suspected animals, and as long as contact horses were apparently healthy no further heed was taken of the outbreak. Thus was the disease harbored and scattered over the country.

At this time the City of Minneapolis paid three dollars to any veterinarian reporting a case of glanders to the health department. This helped some to locate the disease, but the majority of owners sold infected horses to cheap dealers and jockeys, who would run the animals into the country districts. Electricity succeeded the horse, or motive power of our street railways, and many infected horses were sold to farmers and the disease spread broadcast.

As we developed our live stock and more graduated veterinarians located in the state, it followed as a sequence that the diseases of live stock were
brought before the public and conditions became such as to demand the service on the State Board of Health of a veterinarian conversant with these ailments. It took but a short time for the attention of the authorities throughout the state to be drawn to the fact that the control of this disease must rest entirely in the hands of veterinarians. Local practitioners were doing good work in reporting its existence, but opposition to local men and their tendency to overlook many things was somewhat of a handicap, hence veterinarians were employed by the State Board of Health to work from headquarters, devoting their entire time to the public service.

All contact horses were required to undergo the mallein test and many reactors were quarantined and retested time and again, but very rarely destroyed unless they became clinical cases or the owner requested their destruction. Often times a reactor on the second or third retest would fail to react, would be released from quarantine, sold and later became a source of infection and great losses in another community.

This policy of killing clinical cases and quarantining the reactors continued for two or three years, but was discontinued, and only clinical cases were slaughtered. Contact animals were not tested; another examination was made of contact horses in six months and if no further evidence of the disease was found they were given their liberty. For two or three years longer this method continued and glanders rapidly increased.

In 1903 the Live Stock Sanitary Board was created and immediately it was decided to slaughter at once all clinical cases and mallein test contact horses. At the time the board was created the legislature authorized the payment for all glandered horses from state funds. The bill unfortunately carried no appropriation.

At the time our Board assumed charge over one hundred cases of glanders were awaiting investigation. During the first year some 3,000 horses were inspected and 554 killed and 179 held in quarantine. These animals were scattered in every county in the state.

The next year, ending July 31, 1905, 480 horses were slaughtered, making a total of 1,034 in two years. No reimbursement had been granted owners, for the reason no appropriation had been granted by the legislature. Claims were, however, filed and presented to the next legislature for consideration, and sufficient funds were appropriated to pay all claims, and an extra appropriation of $35,000 annually was provided.

The generosity of the legislature in providing funds for future payment of glandered horses became generally known and as a result more reports of the existence of the disease were brought by owners to our notice the following year, and the number of animals slaughtered was the largest yet experienced, 605 being the total number.

For the years ending July 31, 1907 and 1908, a little over 500 horses were killed in each of the two years. Owners were desirous of slaughtering non-clinical reacting animals rather than have them remain in quarantine.

The following year (1909) showed a marked decrease, there being but 353 horses appraised and killed.
For the year 1910 the efforts of the Board began to show the results of its progressive policy in slaughtering and reimbursing owners for glandered horses, 213 horses being killed.

This year, ending July 31, 1911, still more gratifying results were shown and only 141 horses were killed.

Glanders was very prevalent in Minneapolis and St. Paul from 1895 to 1907. It had been customary to kill over 100 horses yearly in Minneapolis, while St. Paul provided about fifty annually. Recognizing that the public drinking fountain for horses was dangerous, the Board issued an order closing the same and suggested a faucet system which would require teamsters carrying a pail. The cities obeyed the order and from 1907 the disease gradually disappeared. This year but seven horses have been killed in the two cities, and these had been brought in from outside country points and from other states.

In the outbreaks where some of the animals are clinical cases, viz., enlarged glands, discharge from nostrils, ulcers, etc., the policy of the Board has been to kill all clinical and all positive reactors, and to retest all the contact horses and the nonpositive or questionable reactors within two months, destroying all those that react and releasing the remainder from quarantine.

In the course of our investigations it was found that the disease had been introduced among farmers' horses by animals that had worked in the lumber camps. Again many lumber companies had been in the habit of selling their stock at the end of the logging season. This source of spread being recognized, our field veterinarians some five years ago began a systematic inspection of all lumber camps in the state, making one or two inspections of each camp during the logging or winter season. The results of these inspections were appalling in some cases. In many cases a number of horses hired from other states were found diseased and were slaughtered. In one case no less than twenty horses owned by a non-resident, who had hired them to a lumber company, were found affected with glanders soon after arrival in our state.

The loss to the lumber companies in some cases was quite large, as they were required to reimburse owners for the animals killed. To guard against this contingency many companies who annually hired horses were induced to insert in their contracts a provision requiring animals to be tested. In this way diseased animals were excluded and considerable loss avoided.

The fact the Dominion of Canada and some of the Northwestern states required the mallein test of all imported horses has been of great help to our Board in locating latent cases and hidden sources of infection.

The following are tables showing results of the work of our Board with this disease:

<table>
<thead>
<tr>
<th>Year</th>
<th>1903-'04</th>
<th>1904-'05</th>
<th>1905-'06</th>
<th>1906-'07</th>
<th>1907-'08</th>
<th>1908-'09</th>
<th>1909-'10</th>
<th>1910-'11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Killed</td>
<td>554</td>
<td>480</td>
<td>606</td>
<td>516</td>
<td>513</td>
<td>353</td>
<td>213</td>
<td>141</td>
</tr>
<tr>
<td>Year</td>
<td>St. Paul</td>
<td>Minneapolis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>59</td>
<td>117</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>51</td>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1906</td>
<td>71</td>
<td>117</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
THE PROBABLE INFLUENCE OF THE OPEN WATER TROUGH IN THE
SPREAD OF GLANDERS.

By A.T. Kinsley, M.S., D. V. S., Kansas City, Missouri.

The control of glanders has concerned practically all civilized countries
for several centuries. Sanitary regulations for the control of this disease
have been modified from time to time in accordance with the newly acquired
knowledge of the Bacterium mallei, which was positively identified in 1882.
Experiments conducted by various investigators have thrown much light on
the microbiology of the Bacterium mallei, and particularly upon those char-
acteristics which are of prime importance in the sanitary control of glanders.

The general principles of the control of glanders in different localities
are similar, but many of the details may differ because of variation of the
factors concerned in the spread of this disease. Then the control of glanders
in rural communities involves the same principles, but it is not as difficult
and does not involve the same details as the control of this disease in cities.
With the present knowledge of the microbiology of the B. mallei, glanders
should be relatively easily controlled.

The control of glanders, like the control of any infectious disease, resolves
itself into a clear understanding of three things: first, the length of time
that the pathogenic organism retain their virulence outside of the animal
body; second, the source of infection; and channel of entrance of the in-
fectious agent, and third, the avenues of elimination of the infection from the
animal body. The first and third factors mentioned will not here be dis-
cussed.

In general, bacteria gain entrance into the animal body either through
the skin or through the mucous membrane of the digestive tract, respiratory
channels, genito-urinary system, or the conjunctival mucous membrane. The
most important channel of entrance of the B. mallei is still a disputed
point and many experiments, some valuable and some valueless, have been
conducted to prove the most frequent channel of entrance of this micro-
organism into the animal body. The B. mallei like any other micro-
organism, gains entrance to the tissues of the body, either through the
mucosa of the digestive or respiratory tracts, skin or ocular mucous mem-
brane. The disputed point is, "Which is the most frequent channel of
entrance?" It is possible that variation of the surrounding conditions may
be responsible for the variation of the most frequent channel of entrance.

In referring to different authors, one finds varying opinions as to the
most frequent channel of entrance. Friedberger and Frohner hold the view
that the most frequent channel of entrance is through the respiratory tract.

Viborg, in 1793, recognized ingestion glanders. Simonds, Renault and
Bouley produced glanders in horses by giving them water contaminated with
the B. mallei. Schultz, Nocard and M'Fayden transmitted glanders to
horses proven to be free of infection by mallein testing, by introducing the 
B. mallei directly into the stomach.

"Inoculation in a skin wound or abrasion is the most effective mode of 
transmission, but the virus undoubtedly enters in certain cases with the air, 
food or water, or by the accidental lodgment of a speck of the virus on the 
mucosa of the eye, nose or other natural opening. Through the mucosa the 
bacillus may enter, ................... Skin, in its healthy state, is us-
ually resistant, but Babes has conveyed infection by rubbing the skin with 
virus mixed with vaseline, ................... There is ample evidence 
that primary lesions appear not only in the skin and nasal mucous membrane, 
but also in the bronchi, intestines and other parts. (Law).

"I long ago arrived at the conviction that not only is infection possible by 
ingestion, but that this mode of introducing the poison is by far the most 
common." (Hunting).

From limited observations the writer is of the opinion that the open 
water trough is a source of infection and that animals become infected by 
the ingestion of water contaminated with the discharges of glandered an-
imals, as well as by contact with glandered horses while drinking, by licking 
discharges of glandered horses from the margin of the drinking fountain 
and by coughing and sneezing, thus forcibly carrying infected discharges 
from diseased to healthy horses.

The percentage of horses infected that drink at public watering fountains 
probably depends upon the type of fountain. To substantiate the foregoing 
views, the following data is presented:—

Dr. S. H. Ward, of the Live Stock Sanitary Board, of Minnesota, kindly 
supplied the facts and figures for St. Paul and Minneapolis.

<table>
<thead>
<tr>
<th>Year</th>
<th>S. Paul</th>
<th>Minneapolis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1904</td>
<td>50</td>
<td>117</td>
</tr>
<tr>
<td>1905</td>
<td>51</td>
<td>110</td>
</tr>
<tr>
<td>1906</td>
<td>71</td>
<td>177 Fountains closed.</td>
</tr>
<tr>
<td>1907</td>
<td>34</td>
<td>48</td>
</tr>
<tr>
<td>1908</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>1909</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1910</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>1911</td>
<td>0</td>
<td>7 up to present time.</td>
</tr>
</tbody>
</table>

A year represents the time from August 1st, of one year, to July 31st of 
the following year.

From the above table it is noted that glanders was quite prevalent in St. 
Paul and Minneapolis until the closing of the drinking fountains in 1906. 
Since that time the number of cases has diminished materially, there being 
only four cases reported in St. Paul and five in Minneapolis in 1909. Seven 
of the eight cases of glanders in 1910, in St. Paul, according to Dr. Ward, 
were due to the fact that during this time, glanders was discovered in a feed 
barn where over 120 horses were tested, of which seven reacted and were 
destroyed. In Minneapolis, during 1910 and 1911, the majority of horses 
killed were reactors found on testing horses in transit to other states.
Dr. D. F. Luckey, State Veterinarian of Missouri and Dr. R. C. Moore, Deputy State Veterinarian of Kansas City, Mo., kindly supplied the following data:

<table>
<thead>
<tr>
<th>Year</th>
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<th>Rest of State</th>
<th>Total</th>
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<tr>
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<td>2</td>
<td>30</td>
<td>32</td>
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<tr>
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<td>0</td>
<td>22</td>
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</tr>
<tr>
<td>1898</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>1899</td>
<td>0</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>1900</td>
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<td>1901</td>
<td>18</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td>1902</td>
<td>113</td>
<td>47</td>
<td>160</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Kansas City</th>
<th>St. Louis</th>
<th>St. Joseph</th>
<th>Out State</th>
<th>Total</th>
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<tbody>
<tr>
<td>1903</td>
<td>296</td>
<td>10</td>
<td>56</td>
<td>363</td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>83</td>
<td>5</td>
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<td>192</td>
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<tr>
<td>1905</td>
<td>69</td>
<td>4</td>
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<td>1906</td>
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<td>113</td>
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<tr>
<td>1907</td>
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<tr>
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<td>180</td>
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<tr>
<td>1909</td>
<td>67</td>
<td>23</td>
<td>26</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>86</td>
<td>16</td>
<td>4</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>1911</td>
<td>58</td>
<td>12</td>
<td>23</td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>

Number of cases in Kansas City from 1896 to 1911, 995.

Number of cases in rest of state from 1896 to 1911, 624.

Number of cases in Kansas City, Mo. from 1901 to 1911, 999.

Number of cases in rest of state from 1901 to 1911, 408.

The year in the above table is from December 1st to November 31st inclusive.

On reviewing this data, it seems at first sight no definite conclusions can be drawn; however, on an analysis of the various factors this data is of considerable value. The first portion of this report from 1896 to 1902, perhaps is not very accurate, as the efforts to eradicate glanders was not systematically applied at this time. It is noted that there were 101 out state cases in 1904. This was due to an extensive outbreak in a grading camp, in which fifty-four horses and mules were found to be affected with glanders and were destroyed. The reason for the large number of cases in Kansas City in 1903 is explained by the fact that during June and July of this year, many local veterinarians were employed to make a barn to barn canvass and examine each horse individually. During these two months over two hundred cases of glanders were officially diagnosed and destroyed; further, it may be stated that immediately following this canvass the public watering troughs were closed and remained closed until April 1904, when they were again thrown open to the public use through the efforts of the Humane Society. During March and April 1904, no cases of glanders were reported. In June 1904, two months after the drinking fountains were reopened, several cases of glanders were reported. During 1905 and 1906, the fountains were closed periodically and it was noted that within six weeks after these fountains were closed, the number of cases of glanders diminished. From 1907 to 1910.
the watering fountains were left open most of the time and glanders in Kansas City was probably as widespread as in 1903, although the tables do not so indicate. It was found that many cases of glanders were sent direct to the dessicating plant without being reported to the state, there being in some months as many as forty or fifty cases of glanders disposed of by this means, probably more than three hundred during the year. The fountains were closed during 1910 and although from the above table there seems to have been an increase in the number of cases of glanders, this is explained by the fact that the members of the Team Owners' Association were active in locating and reporting all cases of suspected glanders, hence the official record includes practically all cases which developed during the year. The authorities have been led to believe that the cases of glanders reported for the last year represent quite accurately the number of cases that appeared in Kansas City during that time. It is interesting to note that although St. Louis has more than double the population of Kansas City, Mo., relatively few cases of glanders have been officially reported from that city in spite of the fact that they have open drinking fountains, but it is possible that many cases of glanders were disposed of in other than official means and the St. Louis fountains are of a different type than those used in Kansas City. Many fountains that were in use in Kansas City were about four feet high and were relatively small and shallow, had flaring margins, and were not more than three feet in diameter. The size of the fountain facilitated contact between different horses when they were being watered as well as preventing a very great dilution of the discharges of horse drinking at the fountain, and the flaring margins favored the accumulation of discharges, three conditions which favor transmitting the infection to the horses watered at these fountains. The drinking fountains in St. Louis are large, in some instances being as much as 18 feet in diameter, three to four feet deep, and having perpendicular sides. These large tanks are an efficient means of diluting the discharges contaminated with the B. mallei, and the large tank also prevents contact with other horses drinking on the opposite side. The perpendicular walls do not favor accumulation of discharges.

The number of the cases of glanders in St. Paul, Minneapolis and Kansas City is apparently significant, and although these facts should be of some value in determining whether the water fountain is a factor to be considered in preventing the dissemination of glanders.

FURTHER REPORT ON ARSENICAL DIPS AS REMEDIES FOR CATTLE TICKS.


At the meeting of this Association two years ago, I reported the results of several investigations concerning arsenical dips with references to their use as remedies against cattle ticks. Since that time, a number of other investigations have been completed. In these investigations, I have been associated with Dr. H. W. Graybill of the Zoological Division of the Bureau of Animal Industry. Including the work done prior to the former report, some twenty odd experiments have been carried out. A full account of these experiments will be found in Bureau of Animal Industry Bulletin 144, now in press, so that it will me unnecessary at the present time to discuss them in detail, and I will therefore consider them only briefly and in a general way.
Composition of the Dips Used.

In most cases, the dipping solutions used in the experiments were similar to those now in common use in tick eradication, prepared from arsenic trioxid, sal soda, pine tar and water. In such dips, when freshly made, the arsenic is in solution in the form of sodium salt, known as sodium arsenite, which results from the chemical action which takes place when arsenic trioxid and sal soda are boiled together. A proprietary dip containing potassium arsenite, and other ingredients of minor importance was tried with satisfactory results. Other dips containing trioxid and alum, and arsenic trioxid and zinc sulphate were found to be unsatisfactory. A combination of the common sodium arsenite dip and emulsified crude petroleum proved unsatisfactory in one field trial.

The strengths of the various dips experimented with, expressed in terms of the percentage of total arsenic in solution reckoned as arsenic trioxid, varied from 0.16 to 0.495 per cent, in most cases approximating 0.2 per cent.

Mr. Fuller of the Biochemic Division of the Bureau of Animal Industry, has determined an interesting and important fact relative to sodium arsenite dips, namely, that when such dips after use are allowed to remain in the vat, their composition undergoes a change by gradual oxidation of the arsenite to arsenate. The practical importance of this fact rests in the probability that arsenates are somewhat less efficacious against ticks than arsenites; accordingly, it is probable that sodium arsenite dips when left in the vat and used repeatedly suffer a gradual loss in efficacy. Details of Mr. Fuller's investigations are given in the Bureau of Animal Industry, Circular 182.

Effects of Arsenical Dips on Cattle.

The effects of the dips upon cattle were almost invariably slight. No constitutional symptoms were observed except in one experiment in which a dip containing 0.476 per cent of arsenic trioxid was used, and these may have been secondary to severe skin lesions. The calf dipped in this strong solution lost considerably in weight and did not begin to recover from the effects of the dip until about a month after dipping. In another experiment a calf dipped in a still stronger solution (0.495 per cent) of arsenic trioxid showed no signs of injury other than slight skin injury. Two lots of cattle, not infected with ticks, dipped repeatedly at intervals of two and three weeks, respectively, in a dip containing an equivalent of about 0.22 per cent arsenic trioxid, gained less in weight than any other uninfested cattle kept under the same conditions undipped, but it is uncertain whether this difference was due to the dipping.

In all cases in which cattle were dipped or sprayed once or twice in arsenical dips containing an equivalent of from 0.16 to 0.24 per cent of arsenic trioxid, the injurious effects observed were confined to the action of the dips upon the skin, and scarcely ever was this action more than very mild, though in some cases the animals were treated in hot weather when the injurious effects from dipping are especially likely to appear. The signs of the effects of dipping on the skin in various instances became evident in from three to nine days after the treatment, at which time a more or less well-marked epidermal exfoliation or dandrufflike peeling of the superficial layers of the skin appeared, confined as a rule to the dewlap neck, escutcheon, inner side of thighs, and scrotum. No marked inflammation preceded the
exfoliation, though occasionally a slight irritation of the skin in places was observed.

In a number of cases the skin became somewhat thickened on certain parts of the body, namely, on the escutcheon, inner side of the thighs, dew lap, and neck. In rare cases cracking of the thickened skin occurred. In one experiment in which cattle were sprayed once with an arsenical solution containing an equivalent of about 0.17 per cent of arsenic trioxid, to which had been added 10 per cent of crude petroleum emulsified with soap, rather severe skin injury was observed in the case of some of the animals, consisting in exfoliation, thickening and cracking of the skin, with evident soreness, which caused the animals to become stiff and lame. These effects were apparently largely due to the oil, as the skin of cattle sprayed in the same dip before addition of the crude petroleum showed scarcely any signs of injury. In the case of a few animals in some of the experiments a slight loss of hair accompanied the exfoliation. Bulls seemed to be more liable to skin injury than cows and steers. The effects of a second dipping, so far as observed, were always less than those of the first. When fresh exfoliation occurred as a result of a second dipping given within two weeks after the first, it became noticeable in from eight to thirteen days after the second dipping.

On the basis of the results of our experiments, it may be concluded that arsenical dips containing an equivalent of not more than 0.24 per cent arsenic trioxid may be safely used on cattle, and the treatment once repeated seven or more days later, the only injury to be expected, as a rule, being more or less epidermal exfoliation and sometimes slight soreness or tenderness of the skin, local in character. In making this statement, it is understood that accidents resulting from lack of proper precautions in the use of arsenical dips are excluded from consideration. Furthermore, in view of the lack of data in our experiments, except in one instance, as to the effect of numerous repeated dippings, it would be unsafe to assume that cattle may be dipped repeatedly at intervals of several days without injury. Field experience indicates, however, that cattle may be safely dipped over considerable periods of time at intervals of two weeks or more in sodium arsenite dips, containing an equivalent of approximately 0.2 per cent arsenic trioxid.

**Effects of Arsenical Dips on Ticks.**

Although the experiments discussed in the present paper have clearly shown that ticks are very sensitive to arsenic, they have added little to our knowledge of the mechanism of the action of arsenical dips on ticks.

Watkins-Pitchford, however, in South Africa, has recorded some interesting experiments which indicate that where cattle are dipped or sprayed repeatedly with an arsenical solution, arsenic accumulates in the skin, and that sufficient arsenic may accumulate to produce a marked effect on ticks which attach to cattle thus treated. Investigations bearing on these important points are now being carried on by Mr. Chapin of the Biochemical Division and Dr. Graybill, but as yet their results are not ready for publication. I may, however, take the liberty of saying that they partly confirm the observations of Watkins-Pitchford.

Though it appears probable that ticks may absorb some arsenic from the skin of dipped cattle, it is certain that the action of arsenical dips upon ticks does not take place in this one way alone, for the reason that ticks removed from cattle immediately after a first dipping in an arsenical solution may
afterwards exhibit evidences of having been acted upon by the dip; the effects of arsenical poisoning appear also when ticks are removed from untreated cattle, and are kept under observation after immersing them for a short time in an arsenical solution.

Assuming, however, that Watkins-Pitchford is correct in the interpretation placed upon the results of his experiments, we may say that arsenical dips not only act directly upon ticks as a result of the absorption of arsenic through the cuticle, through the mouth, through the breathing pores, or through other openings of the body, but also act indirectly, as a result of the deposition of arsenic in the skin of dipped cattle from which in turn the poison is absorbed by the ticks.

Female Ticks.

It was found in the experiments that after cattle had been treated with arsenical solutions, female ticks continued to mature on their bodies, though many succumbed before they reached engorgement. The number maturing, however, became rapidly less day by day, and by the end of a week after treatment, cattle dipped in solutions of proper strength were free or practically free from engorged ticks.

By collecting engorged ticks from cattle immediately after treatment and on successive days thereafter and keeping them under observation, data were obtained bearing upon the question of the fate of ticks which reach engorgement and fall from cattle subsequent to treatment with arsenical dips. Control observations were made on ticks removed on corresponding dates from untreated cattle and kept under the same conditions as those from the treated cattle. In some of the lots of engorged ticks from treated cattle, all of the ticks died without ovipositing, but in most cases some of the ticks deposited eggs. Usually the percentage of ticks ovipositing was low, but in a few instances all of the ticks in a lot deposited eggs. In the lots removed from untreated cattle all of the ticks deposited eggs with few exceptions. The weighted average percentage of ticks ovipositing in fifty-nine lots, removed from cattle during the first six days after treatment was 32 per cent; the weighted average in the corresponding control lots, thirty in number, from untreated cattle was 96 per cent. The number of eggs per capita deposited by surviving ticks from treated cattle was nearly always much less than the number deposited by the ticks in the corresponding control lots from untreated cattle. The weighted average number of eggs per capita, deposited by the ticks collected from cattle subsequent to treatment that survived to deposit eggs, comprising 26 lots, was 365; the corresponding weighted average in the control lots, 13 in number, was 1074. Furthermore, not only were the eggs deposited by ticks from treated cattle less numerous than those deposited by ticks from untreated cattle, but they rarely hatched. On the other hand, in only one instance among the control lots from untreated cattle did none of the eggs hatch. This was on account of the lack of proper moisture, and the same circumstance explains the rather low percentage of eggs which hatched in several other control lots. Of the ticks collected from treated cattle, only four lots deposited eggs which hatched, the percentage being 1 per cent in two instances, and 5 and 50 per cent respectively in the other two. The average (not weighed for fifty lots of which a record was kept was slightly over 1 per cent. The average (not weighed) for the corresponding control lots, thirty in number, was 46 per cent.
With regard to the larvae hatching from eggs deposited by females which had been exposed to the action of arsenical solutions, it was commonly noted that they were in such a weakened condition that they could not extricate themselves from the egg shells, or that they showed such slowness of movement after emerging, that one would be led to believe that they could not successfully attach to a host. This condition, however, is seen not only in larvae from ticks which have been treated with arsenical solutions, but is also noticed in the case of larvae from eggs which have been subjected to other unfavorable conditions, such as low relative humidity and low temperature.

**Male Ticks.**

The male ticks nearly all succumbed within a day or two after treatment. It is highly probable that the few which were found later were ticks which were in the nymphal stage at the time of treatment. No male ticks were found alive after two treatments. It may be concluded that arsenical dips are highly efficacious in the destruction of male ticks.

**Nymphs and Larvae.**

It was observed in the experiments that the great majority of ticks in the nymphal stage were killed by a single treatment and that none survived a second treatment given seven to ten days after the first. In several experiments, however, some of the nymphs survived a single treatment and afterwards molted.

No instance was observed of the survival of ticks in the larval stage following a single treatment. It may therefore be assumed that a single treatment with an arsenical dip of proper strength is sufficient for the destruction of larval ticks.

**Protective Action of Arsenical Dips.**

The experiments thus far completed throw no light on the question as to whether dipping in arsenical solution protects in any degree against reinfection. If the observations of Watkins-Pitchford, already referred to, are correct it would appear that arsenical dips afford considerable protection against reinfection. With our present knowledge, however, it is unsafe to rely upon arsenical dips as protective agents, and it should therefore be assumed that treated cattle are liable to reinfection if exposed at any time after the solution has become dry upon their bodies.

**General Summary of Results.**

Summarizing the results of the experiments discussed in the present paper it may be stated that—

The most efficacious of the dips tested, contained sodium arsenite or potassium arsenite, equivalent approximately to 0.2 to 0.24 per cent arsenic trioxide, and were of about the same strength as a dip prepared on the basis of 10 pounds of arsenic trioxide to 500 gallons of water, which may be designated as of standard strength.

Provided proper precautions are observed cattle may be treated with arsenical dips of standard strength without injurious results.

Ticks are very sensitive to arsenic.
A single application of a standard strength dip is sufficient to kill larval ticks.

Most nymphs are killed by one application of a standard strength dip, but some may survive and afterward molt. No instance has been observed in which nymphs survived two treatments seven to ten days apart and afterwards reached maturity.

Male ticks rarely survive one treatment and have never been observed to survive two treatments in a standard strength dip.

Female ticks commonly remain alive on cattle for several days after a single treatment with arsenical dip, and may continue their development to the engorged stage. Young female ticks are less likely to survive and reach engorgement than those that are nearly engorged. About one-third of the ticks which are engorged at the time of treatment in a standard strength dip, or which afterwards reach engorgement, may be expected to deposit eggs. The number of eggs per capita deposited by such ticks will be much less than the number per capita deposited by ticks from untreated cattle (in the experiments it averaged about one-third the latter). Hatching of eggs deposited by ticks from treated cattle will occur only very rarely. In the experiments about 1 per cent of the eggs deposited by ticks which reach engorgement after treatment hatched, as compared with nearly 50 per cent in the case of eggs deposited by ticks from untreated cattle. Seed ticks hatching from eggs deposited by ticks from cattle which have been treated with arsenical dips commonly have less vitality and are less active than seed ticks from the eggs of untreated ticks.

Cattle become free or practically free from engorged ticks within a week after a single treatment with a standard strength arsenical dip.

Cattle may be rendered free from ticks in all stages by dipping twice in a standard strength arsenical dip, with an interval of seven to ten days between dippings, provided they are not exposed to reinfection subsequent to the second dipping.

EXPERIENCE IN ERADICATING TUBERCULOSIS FROM A HERD.

By N. S. Mayo, M. S., D. V. S., Professor of Animal Husbandry and Veterinary Science, Virginia Polytechnic Institute, Blacksburg, Va.

There is no doubt but that bovine tuberculosis is one of the most serious and at the same time one of the most difficult diseases that live stock sanitary authorities have to deal with. Because of the slow insidious character it is difficult to impress upon the public the seriousness of the disease, and without a public sentiment to support them, it is almost impossible for state or local sanitary officials to make any progress, as those of you who have tried, even with the best of measures, can testify. Up to the present time the hypodermic injection of tuberculin has been the only method that given fairly satisfactory results in the control or eradication of tuberculosis. With the use of tuberculin there has developed two factions, one of which claims vigorously that tuberculin is of no value but actually a serious source of danger when injected into healthy or tuberculous animals. The other faction holds that tuberculin is the only satisfactory means of detecting bovine tuberculosis; that there
is no danger in its use; that it is practically infallible; and that it is a simple matter to eradicate tuberculosis from a herd by using tuberculin once or twice. Such seems to be the general situation today. It is unfortunate in many respects because bias or prejudice seriously hinders the accumulation of actual facts regarding the use of tuberculin.

During the past twenty-two years the writer has been connected with four different agricultural colleges, in each of which efforts have been made to eradicate tuberculosis from the herd. The difficulties encountered have been greater than was anticipated and in some instances after two or three tests with elimination of the reactors and disinfection. When we were laboring under the impression that tuberculosis was eradicated from the herd we were chagrined and disappointed to have a serious outbreak without apparent cause. I think that we who advocate the use of tuberculin in eradicating tuberculosis err in conveying to the cattle owner the impression that it is a comparatively easy task to free a seriously infected herd from this disease. We must be exceedingly cautious about declaring a herd free when we get no reactions. The following brief history of tuberculosis in the herd of the Virginia Polytechnic Institute, while possibly not typical, may not be greatly different from other seriously infected herds, where a persistent and conscientious endeavor has been made to eradicate tuberculosis.

The herd of cattle at the Virginia Polytechnic Institute was composed largely of pure bred cattle of the leading beef and dairy breeds, comprising Shorthorns, Herefords, Aberdeen-Angus, Holsteins, Jerseys, Guernseys and some grades. The Polytechnic Institute is located on the crest of the Alleghany Mountains, 2,200 feet above sea level, in a fine blue grass region, where the winters are comparatively mild and the summers pleasant. The herd has been kept under better sanitary conditions than the average herd.

Previous to 1901 the college herd was housed in the old farm barns of the Solitude Plantation, owned by the V. P. I., but in 1901 new, commodious, well lighted and ventilated barns were built in another location and the herd transferred to them. The herd has been confined in stables but little. During the winter the cattle are stabled night and during inclement weather, spending the days in yards about the barns. In the summer the dairy cows only are placed in the stables for feeding and milking twice daily. The beef cattle and those not giving milk are in pasture all summer.

The herd was first tested with tuberculin by Dr. E. P. Niles, veterinarian, Virginia Experiment Station, in 1893. Fifty-four animals were tested. One reacted and was killed. Two were considered suspicious and were retested two weeks later, did not react, and were left with the herd.

A "scrub" milch cow, purchased after this test and kept with the college cattle, died from acute tuberculosis the next spring. The herd was retested with tuberculin in June, 1894, with six reactions. The reacting animals were separated and retested one month later and only one reacted. Another soon showed physical symptoms and three of the reactors were destroyed. The other three were isolated and were probably retested and reactors destroyed the following fall. In a recent letter Dr. Niles says: "Following these tests all purchased stock was tested before being added to the herd and in subsequent tests no reactions were obtained with the exception of a Holstein bull,
which was purchased on a local veterinarian's certificate and which reacted to my test and was killed, confirming my diagnosis on post-mortem examination. I had made no tests for a few years before leaving the station."

Dr. Niles severed his connection with the college in 1902 and for two or three years the herd was not tested. In 1905 Dr. John Spencer began testing the herd. Some of the reacting animals were slaughtered, others were placed by themselves in a row of stanchions in the stable, but not otherwise separated from the herd. After Dr. Spencer's test of January 21-23, 1908, when 30½ per cent of the herd reacted, it was decided to ask the assistance of the Bureau of Animal Industry of the United States Department of Agriculture and make a thorough and systematic effort to free the herd from tuberculosis. 'The herd was treated as if there had been no previous tests and 22 per cent reacted to the test in June, 1908. All reacting animals were at once removed from the non-reacting, placed in other quarters half a mile away and kept entirely separate. At the next test made in April, 1909, nearly 35 per cent of the healthy herd reacted. It should be stated that the barns and yards had not been disinfected since the previous test. After this test the stables and yards were thoroughly cleaned and disinfected, as they have been since whenever a reacting animal was found. A summary of these tests will be found in the following table:
### Table: Test Results

<table>
<thead>
<tr>
<th>Name of Person Making Test</th>
<th>Date of Test</th>
<th>Number of animals tested</th>
<th>Number of reacting animals</th>
<th>Percent of reacting animals</th>
<th>Number of previously reacting cases retested</th>
<th>Number of previously reacting cases that failed to react at this test</th>
<th>Number of reacting animals disposed of since last test.</th>
<th>Date of Test</th>
</tr>
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<tr>
<td>Dr. Spencer</td>
<td>Mar. 21-23, 1905...</td>
<td>115</td>
<td>21</td>
<td>18.3</td>
<td>21</td>
<td>21</td>
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<td>Dr. Spencer</td>
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<tr>
<td></td>
<td>April 26-27, 1905</td>
<td>22</td>
<td>9</td>
<td>40.9</td>
<td>1</td>
<td>1</td>
<td>9 11 2</td>
<td>April 26-27, 1905</td>
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<tr>
<td></td>
<td>April 3-6, 1906.....</td>
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<td>26</td>
<td>24.3</td>
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<td>14</td>
<td>12 2 5</td>
<td>April 3-6, 1906.</td>
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<tr>
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<td>25.9</td>
<td>23</td>
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<td>16 4</td>
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<td>May, 1907...</td>
<td>94</td>
<td>22</td>
<td>23.4</td>
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<td>15</td>
<td>7 8 10</td>
<td>May, 1907...</td>
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<tr>
<td></td>
<td>Nov. 11-12, 1907...</td>
<td>27</td>
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<td>...</td>
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<td>...</td>
<td>...</td>
<td>Nov. 11-12, 1907</td>
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<td>39</td>
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<td>12</td>
<td>10 2 14</td>
<td>Jan. 21-23, 1908</td>
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<tr>
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<td>113</td>
<td>22.1</td>
<td>3</td>
<td>22</td>
<td>14 9</td>
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<td>Animal Industry</td>
<td>April 7-8, 1909...</td>
<td>89</td>
<td>34.8</td>
<td>27</td>
<td>11</td>
<td>4 7 28</td>
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<tr>
<td></td>
<td>Animal Industry</td>
<td>Oct. 11-12, 1909...</td>
<td>58</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6 6 32</td>
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<tr>
<td>U. S. Bureau of</td>
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<td>April 27-28, 1910...</td>
<td>57</td>
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<td>2</td>
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<td>52</td>
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<td>0</td>
<td>0</td>
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<td>63</td>
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<td>0</td>
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<td>0</td>
<td>2 0 2 2</td>
<td>Oct. 25-26, 1911</td>
</tr>
</tbody>
</table>

The government inspectors have tested as follows:

- June, 1908—113 cattle. 25 reactors.
- April, 1909—89 cattle. 31 reactors.
- October, 1909—58 cattle. No reactors.
- April, 1910—57 cattle. 4 reactors.
- October, 1910—52 cattle. No reactors.
- April, 1911—63 cattle. 5 reactors.
- October, 1911—57 cattle. No reactors.
The beef and dairy herds are kept separate and there have been no reactors in the beef herd since April, 1909, although there were two old reacting cows among them until May, 1910, and once since. In the dairy herd there seems to be a "Typhoid Mary" that we cannot locate by tuberculin testing or physical examination. In testing cattle with tuberculin the test may fail in two ways. First—Cattle may react to the test and fail to show evidence of tuberculosis on post-mortem examination. The man opposed to tuberculin testing makes much of such failures. Such errors are few and to me are of practically no importance. In the Virginia Polytechnic Institute herd there were 279 animals that can be identified that were tested with tuberculin once or more since 1905. Of these 116 have reacted, or 41.58 per cent. Of the 116 reactors three have failed to show evidence of tuberculosis on post-mortem examination, or 2.6 per cent. Government statistics, covering a much greater number of animals, gives this error at 2 per cent. Tuberculin tests may also fail, in that the animal may not react to the test and still have tuberculosis. Such errors are much more serious than the other class, because a tuberculous animal that may be a source of infection is left in the healthy or non-reacting herd. This failure in testing is difficult to locate and estimate, for it is rare that non-reacting animals are available for post-mortem examination. In my opinion this error is more frequent than reactions that fail to show disease.

If we take the first government test of our herd, when 113 animals were tested, there were probably eleven tuberculosis animals that failed to react, or over 9 per cent. I think this per cent of error is much too high, as four of these reacted to the test.

On November 17, 1908, following the first government test in June, a grade Shorthorn cow in the healthy herd died of tuberculosis. This cow had been tested three times without a reaction, although there was a suspicious rise (101.5-103.0) in May, 1907.

It will be noted from the chart that following the first government test there remained in the healthy or non-reacting herd fourteen animals that had responded once or more than once to previous tests, but did not respond to the government officials' test. Two of the fourteen died of tuberculosis before the next government test, nine months later, making a total of three animals that passed the test and showed no clinical evidences of tuberculosis, but died from the disease within nine months. Of the twelve old reactors in the healthy herd, one was disposed of and we have no further history of her. Eleven were tested at the next government test in April, 1909, and four of them reacted and all proved tuberculous on post-mortem examination. Of the seven reactors remaining in the healthy herd, one was removed and her history is unknown. The remaining six passed the next government test in October, 1909, but one, a Holstein cow, reacted to the next test in April, 1910, and was found badly diseased on autopsy. The remaining five passed the next test in October, 1910, but one Holstein cow began to develop a swelling in the throat during the winter. She passed the next test April, 1910, but was condemned on a physical examination and proved tuberculous. Another of the old reactors proving barren was slaughtered and no evidence of tuberculosis found. A Jersey cow, an old reactor, was removed in May, 1911, on suspicion and was found tubercular but quite well encysted. She reacted in 1905 and 1906 and had been listed eight times since without reacting. Of the fourteen
original old reactors two still remain in the healthy herd, one a Holstein cow that holds the milk record for Virginia, and the other a Shorthorn cow. Both appear to be in perfect health and condition.

It is often claimed that a thorough physical examination of a herd at the time of testing will reveal these non-reactors. While such an examination is very important there are comparatively few cases that can be thus detected.

We test our herd twice a year, in the fall just before going into the stable for the winter and in the spring just before turning on grass. During the past three years we have had no reactors at the fall test, but have had them at the spring test, indicating that they probably contracted the disease in the stables or yards during the winter. I consider frequent and thorough disinfection of stables and yards very important in freeing a herd from tuberculosis, just as important as eliminating an infectious animal. This I believe is where we greatly err—in being lax about disinfection of premises.

There are many points in tuberculin testing that we need light upon. We need a definite standard of tuberculin. We need to know more about what constitutes a reaction. We ordinarily say a rise of two degrees. Why not one and one-half degrees or even one degree? Are there not some conditions that we do not understand that are favorable or unfavorable to getting reactions in a herd? Could we not have a large number of cattle tested with tuberculin just before they are slaughtered in order to determine how many may be tuberculous and not react? Tuberculin testing is not the simple process that many think it to be. It is only by the careful collecting of facts either for or against the test that it can ever be put upon a scientific foundation and thus eliminate many of the puzzling problems that confront us at present.