PROCEEDINGS

Thirty-eighth Annual Meeting

of the

United States Live Stock Sanitary Association

HOTEL LA SALLE, CHICAGO, ILL.

December 5-7, 1934
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R. I.

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Report of the Proceedings
of the
Thirty-eighth Annual Meeting
of the
United States Live Stock Sanitary Association
Chicago, Ill., December 5-7, 1934

WEDNESDAY MORNING, DECEMBER 5, 1934

The opening session of the thirty-eighth annual meeting of the United States Live Stock Sanitary Association, held at the Hotel La Salle, Chicago, Ill., December 5-7, 1934, convened at 10:20 a.m., Dr. Thomas E. Robinson, Providence, R. I., president of the Association, presiding.

PRESIDENT ROBINSON: Gentlemen, the time has arrived for the thirty-eighth annual meeting of the Association to convene.

I am very glad to see so many at the opening session. The Program Committee has arranged a very interesting and instructive program. I hope you will all attend the sessions promptly and feel at liberty to discuss any and all subjects in which you may be interested.

I think we are very fortunate this morning in having an outstanding member of the medical profession to deliver the opening address. His subject will be "The Unity of Human and Veterinary Medicine." It gives me great pleasure to introduce to you Dr. David J. Davis, Dean of the College of Medicine, University of Illinois, Chicago. (Applause.)

DR. DAVIS: Mr. President and Members of this Association: I assure you it is a real honor as well as a privilege to meet this group. I feel that way because I am sure that you as sanitarians in the veterinary science are meeting the larger problems, especially problems in epidemiology, and meeting them in a way that we who are in human medicine cannot meet them.

We are confronted with many serious problems that have to do with epidemics. As far as some are concerned, we are simply up against a stone wall. You have greater liberties than we have in dealing with humans. Medical men are more interested, speaking broadly, in the individual than in groups. You are more interested, and also those in plant pathology, in the mass, and you have very decided advantages. So I feel that you are in a position to teach those interested in human medicine and human sanitary problems a great deal.

I thought that it would be helpful, particularly to us, to discuss with you this general subject, the importance of the unity and closer association of human medicine and veterinary medicine. I am sure that the viewpoint of medical men is very rapidly changing. It is coming to respect, as it never has before, the very important contributions that have been made by animal sanitarians and animal pathologists.

... Dr. Davis then read his paper. ...
THE UNITY OF HUMAN AND VETERINARY MEDICINE

By DAVID J. DAVIS, Chicago, Ill.

Dean, College of Medicine, University of Illinois

The unity of human and veterinary medicine is a point of view accepted by all who understand the fundamental principles of diseases and their transmission. Exact and scientific observation has made this possible. When we consider the large number of diseases common to man and the lower animals, it seems unnecessary to dilate on this point. Many persons continue to maintain the point of view that human and veterinary medicine are separate fields of science largely because they grew up and developed separately and were practiced by different groups. This artificial distinction is unfortunate. The study of disease should not be based on such an illogical differentiation.

There is a basic unity in disease processes that should be respected. Common principles of physiology and pathology underlie manifestations of disease regardless of species. Tuberculosis, for example, can not be divided into human and bovine forms, the one to be studied and investigated by a veterinarian, the other by a physician, without sacrificing something. At the present time, more and more the artificial lines of distinction are being removed. Diseases are being studied as units and their complete natural history is being investigated in all its relations.

Specialization is developing rapidly. This is inevitable and in a way unfortunate since it tends to create barriers which are artificial and to develop a narrow point of view. We need workers who are resourceful enough to study this or that problem intensively but who are also able to envisage the entire field in a comprehensive way. The extreme specialists may be brought into the more general picture here and there and from time to time.

Progress and change are so rapid that, in an address to men familiar with the advances in this field, it would seem more profitable for us to consider together some of our unsolved problems. For advanced students in any field, it is more necessary to appreciate what problems remain to be solved than merely to become familiar with the immense mass of detailed facts and information already acquired, important as the latter may be.

In this borderland of specific diseases common to animals and man, the most magnificent discoveries in the history of medicine have been made. Of these contributions, both veterinarians and
physicians may well be proud. Some were made a generation or more ago; others are more recent. However, it is most gratifying to note that at present there is no indication that interest is lagging or ideas lacking, for at no time before has there been for all of us so many bristling problems.

We are no longer discouraged over tuberculosis. Progress has been definite all along the line. Human tuberculosis is rapidly declining. Here and there in the world are areas where much work still remains to be done. In other places it must be carefully watched. We know enough of bovine tuberculosis to eradicate it. Like typhoid fever, we do not have enough bovine tuberculosis in the human, in this vicinity at least, to adequately teach our students. I am indebted to Mr. H. R. Smith, of the National Live Stock Exchange, for an instructive table which sets forth the death rate from tuberculosis in the United States. This table reveals in a striking way the decrease in bovine tuberculosis from 1917, when federal and state cattle testing was started, up to the present time.

Rabies is common in this country and especially in Illinois. Considering the information we have about its etiology, transmission, vaccination, etc., this disease should be absolutely controlled. It is largely a problem of the worthless stray dog. Our antivivisection promoters, with their absurd and ridiculous sentimental propaganda, are coming to be the chief obstructionists in our program for the eradication of this most horrible of all diseases.

Anthrax, from the days of the poet Virgil, who first described wool-sorters' disease, until the present, continues to challenge our science. Long ago we learned enough to control it but it still remains a menace in some unenlightened areas in the world. One point of interest is that anthrax bacilli have served in the past and still continue to be excellently adapted for fundamental studies in the physiology, immunology and chemistry of bacteria. Devastating as these bacilli may be in nature, when controlled in the laboratory they have taught us much.

We shall never forget the relationship between cowpox and smallpox which enabled Jenner, with the aid of information from milkmaids and from his experiments on human patients, to give vaccination to the world and which has resulted in saving more lives and in the relief of more human suffering than any other single event. It could still save many more lives in the world if people had more intelligence and education. It is gratifying to note, however, that at this moment there is less smallpox in the United States than ever before in its history.
### Table I—Death rate from tuberculosis in the United States.

(Compiled, October 18, 1934, by H. R. Smith, Live Stock Commissioner, National Live Stock Exchange, Chicago, Ill., from data furnished by the U. S. Bureau of Animal Industry and the Division of Vital Statistics, Bureau of the Census.)

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>Tuberculosis</th>
<th>Cattle Tested</th>
<th>Reactors</th>
<th>Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respiratory</td>
<td>Fiscal Year</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Other Forms</td>
<td>Ended June 30</td>
<td></td>
<td>(%)</td>
</tr>
<tr>
<td>1900</td>
<td>180.5</td>
<td>21.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1901</td>
<td>174.5</td>
<td>22.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1902</td>
<td>162.6</td>
<td>21.9</td>
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<td>1903</td>
<td>164.9</td>
<td>23.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>176.2</td>
<td>24.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>166.7</td>
<td>25.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1906</td>
<td>155.6</td>
<td>24.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1907</td>
<td>154.3</td>
<td>24.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>144.0</td>
<td>23.6</td>
<td></td>
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<tr>
<td>1909</td>
<td>137.7</td>
<td>23.4</td>
<td></td>
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<tr>
<td>1910</td>
<td>136.0</td>
<td>24.3</td>
<td></td>
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<tr>
<td>1911</td>
<td>132.7</td>
<td>26.5</td>
<td></td>
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<tr>
<td>1912</td>
<td>125.0</td>
<td>24.7</td>
<td></td>
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<tr>
<td>1913</td>
<td>123.0</td>
<td>24.3</td>
<td></td>
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<tr>
<td>1914</td>
<td>123.5</td>
<td>23.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1915</td>
<td>123.5</td>
<td>22.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1916</td>
<td>119.9</td>
<td>22.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1917</td>
<td>124.6</td>
<td>22.5</td>
<td>20,101</td>
<td>645</td>
</tr>
<tr>
<td>1918</td>
<td>128.6</td>
<td>21.4</td>
<td>134,143</td>
<td>6,544</td>
</tr>
<tr>
<td>1919</td>
<td>107.5</td>
<td>18.1</td>
<td>329,878</td>
<td>13,528</td>
</tr>
<tr>
<td>1920</td>
<td>97.0</td>
<td>17.0</td>
<td>700,670</td>
<td>28,709</td>
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<tr>
<td>1921</td>
<td>85.6</td>
<td>13.3</td>
<td>1,366,358</td>
<td>53,768</td>
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<tr>
<td>1922</td>
<td>84.3</td>
<td>12.1</td>
<td>2,384,236</td>
<td>82,569</td>
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<tr>
<td>1923</td>
<td>81.3</td>
<td>11.5</td>
<td>3,460,849</td>
<td>113,844</td>
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<tr>
<td>1924</td>
<td>78.0</td>
<td>11.7</td>
<td>5,312,364</td>
<td>171,559</td>
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<tr>
<td>1925</td>
<td>75.9</td>
<td>10.8</td>
<td>7,000,028</td>
<td>214,491</td>
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<tr>
<td>1926</td>
<td>76.6</td>
<td>10.7</td>
<td>8,650,780</td>
<td>323,084</td>
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<td>1927</td>
<td>71.4</td>
<td>9.5</td>
<td>9,700,176</td>
<td>285,361</td>
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<tr>
<td>1928</td>
<td>70.3</td>
<td>9.0</td>
<td>11,281,490</td>
<td>262,113</td>
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<tr>
<td>1929</td>
<td>67.6</td>
<td>8.4</td>
<td>11,683,720</td>
<td>206,762</td>
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<tr>
<td>1930</td>
<td>63.4</td>
<td>8.1</td>
<td>12,845,871</td>
<td>216,932</td>
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<tr>
<td>1931</td>
<td>60.7</td>
<td>7.5</td>
<td>13,782,273</td>
<td>203,778</td>
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<tr>
<td>1932</td>
<td>56.4</td>
<td>6.5</td>
<td>13,443,557</td>
<td>254,785</td>
</tr>
<tr>
<td>1933</td>
<td>53.6</td>
<td>5.9</td>
<td>13,073,894</td>
<td>255,906</td>
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<tr>
<td>1934</td>
<td>53.6</td>
<td>5.9</td>
<td>15,119,763</td>
<td>232,368</td>
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<tr>
<td>Totals</td>
<td></td>
<td></td>
<td>130,290,151</td>
<td>2,925,938</td>
</tr>
</tbody>
</table>

**Note:** According to medical authorities, cases of human tuberculosis other than respiratory, such as glandular, bone and abdominal, are to a large extent of bovine origin. The decline in the death-rate from respiratory tuberculosis from 1900 to 1918 is probably due to improved sanitation and medical care. It is apparent that this was offset in its effect on other forms of tuberculosis by the increase in this disease in cattle, during that period, as indicated by the increased percentage retained. While there was no decline in the death-rate from non-respiratory tuberculosis from 1900 to 1917, when the federal and state cooperative cattle-testing was started, the decline in the death-rate from such types has since been pronounced. Note the similarity in the reduced percentage of breeding cattle reacting, the market cattle retained and the decline in the human death-rate from non-respiratory tuberculosis since 1918.

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The contributions of Bruce, followed by a series of investigations on undulant fever both here and abroad, have placed this many-sided disease in a position where it can be attacked and controlled as never before. Comparable as a problem with tuberculosis in some ways, it is certain of extinction in due time by the application of principles and practices now well known.

Foot-and-mouth disease historically is comparable to anthrax in that its causal agent was the first filtrable virus pathogenic for animals discovered. Today it typifies a large group of diseases which present many of our most difficult problems. Fortunately human beings are not often attacked now, but can we be sure they never will be?

Texas fever in cattle, though not transmissible to man, is mentioned here because Theobald Smith and Kilborne years ago made their fundamental observations on the transmission of an organism by means of a vector, the tick in this case, and which pointed the way for the control of numerous diseases both human and animal.

The above statements could be further amplified and many more remarkable discoveries related to indicate the significance of this interesting borderland between human and animal pathology. No more convincing or dramatic reasons need be given to justify our title. These contributions, when put together and correlated, comprise and create a history of disease marvelous in achievement in both theoretical and practical results.

But as workers interested in progress, as already stated, we should ever have in mind the problems remaining unsolved. While we must keep our eye on the ball, as we say, in this great game, we must also try to look a little way ahead in order to meet the ever-shifting onslaught of our disease-producing enemies. Let us therefore set forth some of the problems just now exciting us, problems selected with the idea in mind that they may be mutually helpful to students of both human and animal medicine.

One of the greatest medical problems, possibly the greatest, is the nature and control of influenza. For a thousand years, pandemics have swept around the world at more or less definite intervals. These intervals have averaged roughly about 30 years. Most of us will recall two, one in 1889 and 1890, and the other in 1918 and 1919. The victims numbered into the millions, the 1918-19 scourge killing more people than did the World War. In the interepidemic periods, lesser and more localized outbreaks occur, which seem to be the manner in which the disease is perpetuated.
From past history we may be reasonably sure that some time within the next ten to 15 years, we will be visited again by a pandemic. Heretofore, the world has been helpless before this disease and in every instance it has continued until it burned itself out, presumably killing or immunizing all the susceptibles.

Now, for the first time, there appears a really encouraging lead. Laidlaw, of London, some time ago succeeded in protecting dogs from distemper, a flu-like disease, by means of a vaccine. Continuing the work with Andrews and Smith on human influenza, recently they succeeded in isolating a human influenza filtrable virus, and they discovered further that the ferret is readily susceptible to this virus. Now they have also isolated a virus from swine influenza. They have shown that mice as well as ferrets are susceptible to the viruses and that their hyperimmune horse sera will neutralize the action of the respective viruses in mice.* These results have been confirmed recently by workers at the Rockefeller Institute in this country. From these discoveries in animals suffering with these similar diseases, it would seem now that at least the first step has been made possible in the control not only of human diseases but of their counterparts in animals. We will watch the further work of these men with the greatest interest.

SEPTIC SORE THROAT

For many years milk-borne epidemics have been a serious menace to public health. Typhoid fever outbreaks transmitted in this way long headed the list both in number and morbidity. Recently, however, its incidence has declined greatly and at present milk-borne septic sore throat is rapidly becoming the leader.

This disease appeared in epidemic form in the United States for the first time about 25 years ago. Since then there have been on the average approximately three epidemics a year. These outbreaks, which have been exclusively milk-borne, have varied in size with the amount of infected milk distributed. Some have involved less than 100 patients while others have infected thousands. A hemolytic streptococcus is the recognized cause of the disease.

In the communities concerned, these epidemics always produce a dramatic situation, reminding us of the great plagues in the centuries preceding the introduction of sanitation. The reasons for this are the suddenness of the onset; the large number of simultaneous cases; the alarming symptoms, especially when the

sequelae begin to appear; together with the ignorance of the public in regard to the nature and seriousness of the disease.

We have gradually learned that, in addition to the epidemic form, this disease is probably constantly endemic in the form of sporadic cases and that ambulant cases or carriers occasionally care for cows and in so doing infect them and make epidemics possible. This disease seems so serious that, in the interests of the public health, sanitarians may at any time decide to bar all raw milk, including certified, from the market unless the danger from this disease can be excluded with reasonable certainty.

Two possible sources of streptococci causing these epidemics have been postulated: the one, human, the assumption being that the milk was contaminated from a human source after it had left the cow; the other, bovine, namely, the udder and teats of the cow.

**STREPTOCOCCUS MASTITIS**

The former view has been assumed by some, largely because it is the mode of transmission of other milk-borne epidemics; for example, diphtheria and typhoid fever. However, the evidence, both epidemiological and experimental, at present appears convincing that the udder of cows suffering with streptococcus mastitis is the common, if not the only source, of the infection. Among the facts supporting this view are the explosive nature of the epidemics, indicating massive dosage continued over a definite period of time; the subsidence of the epidemic in certain instances after removal of suspected cows; often failure to locate a human carrier related definitely to the epidemic; the presence of the epidemic streptococcus in the udders of the cows supplying the suspicious milk identical in every way with the organism found in human cases; the experimental evidence indicating that the cow's udder is relatively easily infected with the streptococcus when this organism is smeared on the surface of the teat or about the meatus, as might occur from the hands of a milker; and lastly, the evidence that both human carriers of streptococci and sporadic cases of septic sore throat due to this organism occasionally occur independent of an epidemic.

As to the experimental evidence, this was furnished first in 1912 by Davis and Capps, who caused mastitis in a cow by implanting the streptococcus on the teat after slight scarification about the meatus. In a short time the organisms ascended the ducts causing a mastitis that continued for a long time. In the milk, millions of organisms appeared at each milking. Those results were confirmed later by Mathers, and more recently by Frost and Hadley, and by Graham. These latter workers could quite
readily produce the mastitis by simple implantation on the normal teat without scarification.

Studies by Frost, Hadley and associates were made later which indicated that cows may serve as "carriers" of *Streptococcus epidemicus* by harboring this organism in the udder for long periods with or without serious mastitis lesions. Likewise it has been shown by Pilot and the writer that sporadic cases of septic sore throat occur now and then which might transmit the infection to a cow. Also, in a series of several hundred persons, it was shown that an occasional definite carrier exists who may harbor the epidemic streptococcus for weeks in the throat and tonsils. In several such carriers tonsillectomy caused the organism to disappear quickly. The crypts of the tonsils seem to be their chief habitat.

One seems justified, therefore, in the view that from the hands of a human carrier or sporadic case the cow's teat is contaminated, the organism then ascending to the cisterns and ducts of the udder. Here they multiply under most favorable conditions and then pass out during the milking process and are distributed in the milk to the throats of the consumers.

The all-important problem of prevention presents serious difficulties to the producers and distributors of milk and to the public health officials. Like other so-called animal-human diseases, the difficulty lies in the detection of the animal carrier in time to prevent the dissemination of the dangerous organisms. The problem is not unlike that presented by undulant fever.

Based on past experience with the disease and from what is known at present concerning its bacteriology and mode of transmission, the following suggestions to protect the public most adequately from these epidemics may be reiterated. In the production of milk to be consumed in the raw state, that is, certified milk, the throats, hands and other parts of handlers of milk must be carefully examined for the epidemic streptococci. With present knowledge, all persons suspected of carrying any variety of pathogenic hemolytic streptococci on their persons should be excluded from contact with cows or their products. It may be pointed out that more data are needed on the incidence of *S. epidemicus* in human beings during interepidemic periods. Sporadic cases of septic sore throat are now recognized. The teats require extra precautions. Lesions of all kinds should be treated and healed as quickly as possible. A bacteriologic plate test for streptococci may be made from sores. Streptococci grow or live in abrasions but soon die on smooth skin. Examination of the udder may or may not reveal physical changes. This fact should be
appreciated by every one, especially veterinarians. An examination of the udder, with negative results, may give one a feeling of false security which is dangerous.

Positive physical observations should exclude the animal from the herd. Curdling of the milk may be misleading. It may or may not be indicative of infection with *S. epidemicus*; so too with the presence of blood in the milk.

Special attention should be given to teats and udders that are the seat of injury, scarring, stenotic ducts and similar conditions. They require special treatment, such as catheterization, which is often done without regard to asepsis or antisepsis and may result in infections. I once saw an apparently intelligent dairyman catheterize a teat of one of his best cows after inserting the tube in his mouth and blowing through it.

Dairymen and veterinarians should be alert in cooperating with health officers and the medical profession in the detection of early cases of sore throat. In the epidemic curve, at times, an early slight rise may appear, followed by a drop, before the main onset of the disease. This may be a sufficient clue to warrant an immediate investigation, and valuable time may be saved in instituting precautionary measures.

The real difficulty, of course, the impracticability of examining bacteriologically, at daily or short intervals, the milk from each cow in the herd. The longer the interval between such examinations, the greater the possibility of an udder becoming suddenly infected and issuing a shower of dangerous streptococci into the milk supplies. In general, it may be said, that the more frequent the bacteriologic examination of the milk for streptococci, the less will be the danger of infection.

In the production of pasteurized milk, efficient heating by the holding process is sufficient to kill *S. epidemicus*. All workers are agreed that these organisms are not highly resistant. Heating at 60° C. for 20 minutes is sufficient to kill them.

In all epidemics a certain, though small, proportion of the cases arise presumably from contacts and this mode of transmission should be controlled as far as possible. To do this septic sore throat should be made a reportable disease and proper regulations should be enforced at once.

**Rheumatism and Arthritis**

Rheumatism and arthritis in their various forms continue in both the human and the animal world to occupy a position in the front rank and to present problems of a most puzzling character. The comparative pathology of arthritis has never been studied
adequately. At present the term is applied to a group of diseases, some of bone, some of nerves, others of muscle. Certain forms may be infectious, others may be nutritive. Some seem to be combinations of the above forms in varying proportions and in acute, subacute and chronic forms. Twenty years ago, our interest centered in hemolytic streptococci as causative agents in the infectious types developing under certain conditions and emanating from certain localities or foci of infection in the body. Emphasis later was shifted to the non-hemolytic or green varieties. Now the hemolytic varieties are returning to the limelight in research laboratories either as opportunists or as primary agents. Proof of this specificity is not convincing to all. One fact of comparative pathology I will mention. Varieties of streptococci, and especially the hemolytic types which we consider the most dangerous and aggressive, inhabit the throats and especially the crypts of the tonsils in at least several animals. Deep down in the crypts of the tonsils of the cow, the hog and the dog the hemolytic streptococci pathogenic for animals are present in large numbers quite as they occur in the human tonsils. To what extent they may wander from here and cause lesions in other parts of the body in these animals as well as in man constitutes a series of problems well worth careful and exhaustive study.

Poliomyelitis and Encephalitis

Another problem most disturbing to everyone just now is the nature and mode of transmission of human poliomyelitis and encephalitis together with their subvarieties and related forms. Similar or comparable diseases exist in animals. This is an eminently suggestive field for students and investigators in comparative pathology. Advances made in these studies in one animal are almost sure to be helpful all along the line. Almost any day one feels that the entire problem of the transmission and epidemiology may be opened wide by discoveries in connection with some animal.

In our own state of Illinois, our recent experiences with encephalitis have brought home to us the seriousness and magnitude as well as the difficulties of the problems relating to several diseases of this general group, all of which seem to belong to the filtrable virus type. It may be pertinent here to refer to the progress made in the control of Rocky Mountain spotted fever, a Rickettsia infection, through the discoveries of Spencer, who succeeded in making an effective vaccine from the ticks which contain the virus and are responsible for its transmission from an
animal to human beings. The animals responsible for harboring these ticks comprise a very large group both wild and domestic. Any campaign of eradication of this disease must concern ecological studies of nearly all the lower animals in a given locality. Sanitarians and zoologists experienced in both human and animal diseases are demanded. The problem lately has become far more serious, since this disease, formerly thought to exist only in certain western localities centering in the Bitter Root Valley of Montana, is now known to be widely distributed in the East and South.

With more persons reaching advanced years, as the infections of earlier life are being controlled, a group of certain diseases of mature life and senility have rapidly come to the fore and in our mortality tables are now at the top of the lists, well superseding such diseases as tuberculosis and pneumonia.

**ARTERIOSCLEROSIS**

Occupying the center of the stage with a few other diseases is arteriosclerosis. This condition, with its allied and related forms and their complications, presents truly a monumental problem. As to its cause, pathogenesis, inception and control, we must admit we are grossly ignorant in spite of a large amount of work. Most of the contributions so far have been descriptive. Comparative pathological studies as usual have lagged. It is therefore gratifying to note that recently an interest is manifested in this field by such men as Fox, who has been studying diseases of various animals in the Philadelphia Zoo. Highly suggestive observations in certain lower animals, especially birds, indicate that this condition is relatively common. In birds it seems to simulate closely human arteriosclerosis. It appears in various forms and locations and differs in its manifestations and course in the animals. A study of such material should be most helpful in defining problems and suggesting leads which, through suitably controlled experiments, should result in a better understanding of its nature. At the meeting of the International Society of Geographical Pathology, last summer in Holland, arteriosclerosis was the main topic. Here reports from various parts of the world relating both to humans and animals were presented and correlated. Helpless as we still are in the face of this physiopathological entity, as some call it, such studies are bound to be helpful. Old age in animals is not so serious as in man. Animals are killed early or can be easily disposed of when they reach the retiring age. Not so with humans, at least in this country. Old age insurance, old age pensions, old age sickness benefits,
old age hospitals and homes are problems occupying a more and more prominent place in our social welfare program, in business and in medicine. As I stated, arteriosclerosis and its manifestations present the main pathological problem in advancing years. The medical profession appeals to you for aid in the solution of this problem, which may not be of such practical importance in animals but which may be of such a nature that animals, especially those living under natural primitive conditions, uninfluenced by the highly artificial life to which man is now subjected, may serve to elucidate some of these unknown factors.

CANCER

In this connection a few words should be devoted to cancer. We have now reached the stage where every student of cancer views it as a general biological phenomenon as fundamental and perhaps of the same nature as growth. A more thorough understanding of normal growth would probably solve the problem. From a practical point of view tumors concern every animal and everyone must deal with the problem in one way or another. As the fruit fly enabled Morgan to analyze the chromosomes in a way to permit him and others to see and study the ultimate genes and so understand as never before the nature of heredity, so cancer in some animal or other may manifest itself in a way that will permit some one to make observations that may solve the entire problem.

This reference to genetics leads me to say that human biology and medicine are woefully backward in genetics compared with veterinary science. I am sure I am right in saying that the ordinary student in agriculture, with an elementary knowledge of animal breeding and animal pathology, is better versed in genetics than the average medical man. Not a medical college in the United States, with possibly one exception, gives a required course in this subject. The work in this field in its relation to medicine has never been well organized and geneticists can be of real service to human medicine by applying the principles and facts they have worked out in animals to suitable studies in man. The mating and breeding of human beings are far more difficult than similar problems in animals, for they are hemmed about with social, religious and even political prejudices and are all subject to the difficulties encountered in dealing with problems of psychology, sentiment and sex.

In Illinois, as in many states, no single institution exists for the unified study of disease in its broader relations. We have medical schools for humans, and although there exist veterinary
colleges in some near-by states, here in Illinois, one of the great stock-raising states of the Union, and with a supply of diseased animals for study and teaching here at the stock yards unsurpassed anywhere in the world, we have no veterinary college. This golden opportunity is now largely going to waste. With proper organization and with a relatively small expense budget, a unified scientific institute could be created where students of human and animal diseases could freely intermingle in promoting the science of a unified medicine and in the solution of such problems as I have mentioned, which so manifestly require the aid of both medical and veterinary scientists. As members of this body meeting here, you are not only eminently fitted and qualified but are in a strategic position to assume the aggressive in furthering such projects.

**ADDRESS OF THE PRESIDENT**

By Thomas E. Robinson, Providence, R. I.
State Veterinarian

Members of the United States Live Stock Sanitary Association and Friends: I deeply appreciate the honor you conferred upon me one year ago by electing me President of your Association, which, for thirty-eight years, has been vigorously at work protecting and directing the live stock industry of this great country of ours, an industry which may truthfully be said to be the backbone of our American agriculture; an industry which is of potential importance to every citizen of our country.

It is a well recognized fact that live stock diseases, if ineffectively controlled, entail great losses, not only to agriculture, but to the general wealth of the country as a whole. It has been largely
through the efforts of this Association that fundamental research has been stimulated, that new and improved methods of disease control have been developed and that the live stock disease activities of the country, both state and federal, have been unified and correlated in such a way that the efforts of all agencies have been directed most effectively in combating disease.

We have but to review the history of live stock diseases in this country and compare them with the great losses, especially those caused by epizootic diseases in many foreign countries, to justify the worthwhileness of our efforts. I wish to congratulate this organization and those untiring leaders who, for many years, have so successfully directed its efforts and energies.

It is true that our work will never be done. New diseases, new problems continue to present themselves, but I believe I can truthfully and safely predict that just as long as the live stock sanitary officials of the United States continue to pool their efforts through this Association, just as long as our scientific workers and practitioners in the field of veterinary medicine continue to give of their time and effort as they have during this past year, not only in their own local spheres of influence, but in serving so faithfully on the committees of this Association, we have nothing to fear.

I want to take this opportunity to thank the personnel of all committees for the wholehearted cooperation they have given and for the painstaking work they have done in studying the problems presented to them and preparing their committee reports.

It is very appropriate at this time, that we should, for a moment, pay tribute to those of our membership who are engaged in the field of scientific research, whose efforts have been largely responsible for the development of what we may term "preventive measures" as a means of disease control.

I refer more especially to the progress in building immunization through vaccination and also to the development of effective means of disease detection through the development of certain biological tests, the commercial application of these two scientific developments making it possible for the live stock growers of this country to maintain clean, healthy herds and flocks. I cannot too strongly impress upon you the great influence which these practices are having upon our live stock industry today.

Probably the outstanding event of the year was the holding of the Twelfth International Veterinary Congress in the United States. This proved to be the largest, most widely representative live stock and veterinary meeting of its kind ever held.
Time does not permit but of a brief reference to its many phases. Its work will be reflected throughout this country and the world for years to come. It was a convention comprising leading veterinarians, sanitary officials and stock-owners of 61 nations, with a registered delegate attendance of 755 persons, exclusive of the United States, and with a total attendance in all classes of approximately 3,900.

Among the features of this Congress was an extensive educational exhibit, ably staged and portraying, in a most vivid manner, methods of combating some of our more important contagious and infectious diseases.

The addresses and papers presented at the Congress constituted a most important page in American veterinary history and summarized the most up-to-date information in the world today on these questions.

A unique feature in connection with the convention was the broadcasting of six addresses over a nation-wide hookup of the National Broadcasting Company during the Farm and Home Hour of the United States Department of Agriculture. Three short-wave stations were included in the hookup which made it possible for these addresses to be heard around the world.

We all take pride of the fact that the International Veterinary Congress saw fit to honor the United States by the election of our distinguished citizen and friend, Dr. J. R. Mohler, Chief of the Bureau of Animal Industry of the United States Department of Agriculture, president of that organization. Dr. Mohler has for many years been our friend and supporter in everything that was worthwhile in the veterinary profession and live stock industry.

It is important that we should, each year, get a clear picture of just what the federal government is doing in the way of financial support for disease control activities, for we all appreciate that much of the state support is dependent upon and correlated to federal expenditures. The sum of $4,042,179 was appropriated for indemnifying cattle-owners for cattle condemned as a result of the tuberculin test.

From special emergency appropriations, principally the Jones-Connally bill, $30,000,000 was reserved tentatively for cattle disease work, which was divided by setting aside $12,000,000 for tuberculosis eradication, $17,000,000 for Bang's disease and $1,000,000 for miscellaneous disease work, probably mastitis.

From Federal Emergency Relief appropriations, substantial sums have been set aside for the movement of cattle in the drouth-stricken areas, to be purchased outright by the govern-
ment and distributed among the unemployed during the year by the FERA. You will note from these figures that the live stock industry is to receive very definite benefit in the way of increased appropriations and an extension of the work in the new fields of effort as a result of these emergency activities.

**BOVINE TUBERCULOSIS**

The eradication and control of bovine tuberculosis continues to command a position of leading importance, not only in the activities of the federal government, but on the part of practically all state live stock sanitary officials. It is evident that the eradication of tuberculosis among our live stock will continue to be vigorously carried on until the job is completed.

A report of the United States Bureau of Animal Industry shows that more tuberculin tests were applied to cattle during the year ending June 30, 1934, than in any previous year. The total number of herds tested was 1,256,039, comprising 14,887,746 cattle. Of this total number, 232,150 (1.6 per cent) were positive reactors to the test.

Reports as of June 30, 1934, showed 225,809 fully accredited herds, numbering approximately 3,400,000 cattle, while altogether in the United States there were at that time 4,300,000 herds, comprising 39,000,000 cattle, under supervision for the eradication of bovine tuberculosis. What should be of especial gratification to us is the constantly mounting number of states which are fully modified accredited, the total being today 18, with indications of more states being added shortly.

**AVIAN TUBERCULOSIS**

The presence of tuberculosis in swine continues to present a serious problem in some sections of the country, no doubt, because of the prevalence of the avian type to which swine are susceptible. This leads us to a word about avian tuberculosis, which seems to be very prevalent in the middle western and north central states. The relation of the avian type to swine infection and the wide distribution of infected poultry flocks in this great hog-raising area continues to present an important problem for solution.

While the veterinary profession is rendering valuable service in an effort to work out a plan to bring the avian infection under control, the many complicated problems involved indicate the necessity for the development of a more far-reaching program of testing and elimination of diseased live stock than is now in effect if the hog and poultry industries are to be freed of the scourges of tuberculosis.
Of outstanding significance during the year has been the initiation of a program by the federal government, under emergency appropriations, to test and slaughter animals and indemnify the owners for those reacting to Bang's disease. The work is now under way in nearly all states. According to preliminary tests, it is expected that approximately 15 per cent of all cattle will react to the agglutination test for Bang's disease, while in some sections, it may run substantially higher than this.

The program is conducted on a voluntary basis. Farmers cooperating sign agreements for testing, in which they agree to dispose of their reacting animals by slaughter in order to safeguard their herds.

When purchasing new animals, to maintain certain sanitary safeguards, a retest is made at required intervals. Under these contracts, the federal government makes indemnity payments according to appraised values up to a maximum of $20.00 for grades and $50.00 for registered pure-bred cattle; while in addition to this, the owner receives all returns for salvage, but in no case shall he receive a total exceeding the appraised value of the animal.

Virginia was the first state to pass a state law indemnifying cattle-owners for Bang's disease-infected animals. It will be of interest to observe as a result of the publicity which is being given this work, the activities on the part of other states in passing laws making possible the payment of state indemnity in addition to that now paid by the federal government.

While it is appreciated that this program of Bang's disease testing has been initiated as a cattle-reduction measure, I venture to suggest that its greatest importance will be in cleaning up a diseased condition among our herds, the presence of which greatly impairs the production, breeding and economic worth of a great majority of our herds of cattle, as well as safeguarding the health of our people through removing the possible cause of undulant fever.

**Hog Cholera**

Hog cholera, in my judgment, continues to present a real economic problem and is not being satisfactorily controlled on a nation-wide basis at the present time. The only way this disease can be successfully combated is through the development of a nation-wide program involving restrictions as to the use of hog cholera virus, the more extensive use and systematic practice of immunization, and the restriction of such practice to competent
veterinarians. I would like to suggest that a careful study of this question and a suggested program be developed by a proper committee of this Association.

Rabies

To the best of my knowledge, our Association has never undertaken, in any serious way, the problem of rabies control. Today, activities in this field are, as it were, running wild. It is true that individual states have enacted laws looking to the control of this disease, but none show any degree of unification in reference to the methods employed.

I am convinced that if this Association, through a proper committee, made a study of this problem and recommended a nationwide program, that it would result in many less cases of rabies than now exist. Such a program should include an active educational campaign and stringent state laws regarding confinement of dogs especially during epizootics, the question of vaccination, and its proper use and control. While I probably have more faith in vaccination than many of you, having seen it work out successfully in my own state, I believe it has a place, a very definite place, in rabies control.

Texas Fever

It has been nearly thirty years since tick eradication began in the United States. At that time, nearly all states from California to the Atlantic Seaboard and the southern half of the country were infected with tick fever. Now, all states are free from the tick, except Louisiana, Texas and Florida, and the greater part of these states is free from Texas fever. A few counties in Mississippi have recently been put back in the quarantine area on account of the tick, probably coming from Louisiana. With the work of complete eradication so nearly accomplished, it would seem that the program now in effect and in good hands should shortly accomplish complete eradication.

Mastitis

I wish at this time to call the attention of the Association to the growing prevalence, among the dairy herds in our country, of mastitis, a disease which results in great economic losses to the dairymen, and which jeopardizes public health. Various forms of treatment has been advanced from time to time, none of which has proved entirely satisfactory. Here again, I believe that our Association can render a real service to the dairy industry by making an intensive study of mastitis, with the hope that with the use of it will come more effective control measures.
It is my understanding that the federal government has already set aside a substantial sum of money for work with this disease. A committee from among our membership, if given this special problem, could work with the federal agencies to develop the necessary fundamental research which is so essential, if practical control measures are to be worked out.

**Pullorum Disease**

I wish to call your attention most earnestly to the national program for the poultry industry recently submitted to the Secretary of Agriculture by the National Commercial and Coördinating Committee, as required by subsection 9 of section 3 of article VIII of the Code of Fair Competition for the Commercial and Breeder Hatchery Industry.

This program sets up uniform terms, rules and regulations for poultry flock improvement and disease eradication. The disease section of the program is of especial interest to all of us because of the terms used and the methods devised for testing and recognizing flocks in pullorum disease eradication.

The plan provides for pullorum-tested, pullorum-passed and pullorum-clean classes of chicks, flocks and hatcheries, these terms denoting the various degrees of their progress in the clean-up work.

You will note that the use of the word "accredited" has been entirely eliminated from the terminology and that a series of new terms have been suggested. The term "tested" applies to flocks tested and reactors removed; the term "passed" applies to flocks tested and no reactors at the last test; and the word "clean" applies to flocks in which no reactors were found in two consecutive tests not less than six months apart.

No doubt this pullorum disease eradication procedure will be completely presented in the report of the Committee on Transmissible Diseases of Poultry and be thoroughly discussed by you. I thought, that in presenting it to you at this time, I could stress the importance of this question through the need for uniform procedure and the desirability of our Association lending its fullest cooperation to the poultry industry in this matter.

In the interest of unification and recognized official procedure, it would seem appropriate for this Association to take specific action and to make specific recommendations with respect to each of the following four definite points:

1. The adoption of an official test for the detection of pullorum disease-carrier breeder birds on the basis of the majority of experimental evidence available at this time.
2. To suggest uniform requirements for the materials and technic used in conducting and interpreting this test.

3. To present the field requirements necessary to operate the plan efficiently.

4. To arrange for a conference of the proper committee of the Association with a committee representing the hatchery and breeder industry for the purpose of adopting requirements for a mutual program to be recommended to the U. S. Bureau of Animal Industry for use in establishing a uniform, voluntary, cooperative, regulatory program for the control of pullorum disease in hatcheries in the United States.

To the end that these questions may be thoroughly and competently discussed, I have arranged for a special session to be held in connection with this meeting, of the Committee on Transmissible Diseases of Poultry, including any and everyone who may be interested in this problem.

I have not attempted to discuss in detail these major disease problems, nor have I attempted to enumerate minor diseases with which our members are concerned, feeling that these matters can best be left in the hands of more trained and more competent persons than myself and I believe that the matters in which you are interested will, in all cases, be presented in committee reports.

I have, however, called to your attention a few outstanding questions, in the solution of which, I believe, our Association can play an important part through intensive and immediate action.

I am also convinced that the United States Live Stock Sanitary Association can and should do something to aid in the codification of the various rules and regulations that now exist in the control of animal diseases between the several states.

We recognize that a state has a right to quarantine against the introduction of live stock from a neighboring state. We realize, also, that there are 48 states which may have as many different types of rules and regulations in respect to the entrance of animals affected with even a single disease. It is my thought that, if a careful study is made of these various rules and regulations, taking one disease at a time, and a comprehensive report is made of such study by individual diseases, much benefit would come out of it, to the end that the rules, regulations, laws, etc., now in effect, could and would gradually be brought to a more simple and uniform basis.

In conclusion, I wish to take this opportunity to again thank you members of the United States Live Stock Sanitary Association for the honor of serving as your President and to say to you
that I have enjoyed most fully the work of the past year, and I want at this time to express my appreciation and deepest thanks to the officers and to the many persons who have served so faithfully on committees, because I feel that it is to them and the painstaking efforts which they have put forth, that the Association is really indebted.

My concluding thought to you is, in the past you have served our livestock industry faithfully and efficiently and the future holds still greater opportunities for service.

DR. A. T. KINSLEY: I would like to move that this able address be referred to the Executive Committee.

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

PRESIDENT ROBINSON: Now we come to a very important part of our program, our memorial service. I will call on Dr. Kinsley to take the chair.

. . . Dr. Kinsey assumed the chair. . . .

CHAIRMAN KINSLEY: Gentlemen, the Grim Reaper has made further inroads into our membership and, according to our usual custom, we will pause now in our deliberations for a moment and express our sincere regrets and deep sorrow for our colleagues who have departed during the last year, and also to express to the families of these members our deep sympathy for their having passed on to their great reward.

Now may I ask you to stand for a moment with bowed heads in silent prayer?

. . . The audience stood in silent tribute to the departed members.

CHAIRMAN KINSLEY: Dr. J. L. Axby will complete the memorial service.

. . . Dr. Axby read a memorial tribute. . . .

Mr. Chairman and Members:

During the past year, the messenger of death has called from early service the following members of the United States Live Stock Sanitary Association.

Dr. A. E. Behnke, of Milwaukee, Wis., died on November 12, 1934. After spending his early life at New Ulm, Minn., Dr. Behnke entered the Chicago Veterinary College and was graduated with the class of 1892. He entered the service of the U. S. Bureau of Animal Industry, October 1, 1895, where he remained until he retired in December, 1932.

Dr. W. G. Hollingworth, of Utica, N. Y., died on September 2, 1934. Born in Utica, August 24, 1861, Dr. Hollingworth was graduated from the American Veterinary College in 1884, remaining for one year as resident surgeon. He entered general practice in Utica in 1885. When the position of City Veterinarian was established more than 30 years ago, he was appointed to the position and continued to fill it, except for a period of two years. During most of the time he served without remuneration. In 1922, the position of Chief of the Division of Food Hygiene was created, and Dr. Hollingworth was named to head the new division. In 1931, he was voted Utica's most useful citizen.

Dr. U. G. Houck, of Washington, D. C., died on April 24, 1934. Born in Luzerne County, Pa., January 3, 1866, Dr. Houck was graduated from the University of Pennsylvania in 1895 and was, for a period, resident
surgeon of the Veterinary Hospital of the University. He entered the service of the U. S. Bureau of Animal Industry in 1895 and continued in the service until his death. He was a pioneer in the organization of the enlarged meat inspection service provided by the Meat Inspection Act of 1906, and served as Associate Chief of the Inspection Division, from July 1, 1906, until April 15, 1907. Since April 16, 1919, he had been Chief of the Division of Hog Cholera Control. To mark the 40th anniversary of the founding of the U. S. Bureau of Animal Industry, in 1924 Dr. Houck compiled a historical sketch of the accomplishments of the Bureau, entitled "The Bureau of Animal Industry of the United States Department of Agriculture, Its Accomplishments and Achievements." The book is regarded as the best composite record ever written of the services of the Bureau to the live stock industry and the public.

Each deceased member has his individual biography, which, if written, would well constitute an example of life worthy of emulation by future posterity; however, I shall in my weak and insufficient way, endeavor to pay tribute to them collectively. They faced life as the way of the strong. Courageously they accepted circumstances not as good or evil, according to appearance, but as the material with which they were to build an existence, receiving apparent evil as unflinchingly as apparent good, and apparent good as impassively as evil. Theirs was the philosophy of mastery, an expression of the will to take whatever life offers in the way of material and mold from it the best existence possible, turning adversity into advantage, slowly molding lives of character, purpose and service, clearly disclosing that they realized:

Now is the only time you own;
Live, love—toil with a will.
Place no faith in tomorrow, for
The clock may then be still.

Nothing we may say here can affect them, but from their lives we are deeply affected, and the lessons they taught are for us to carry on—fall not, continue the forward march of science, research and control, enlarge the field of service, bind closer the bands of friendship, and practice in our daily work and with our associates, the attributes of our departed brothers, that we may say as they could have said:

I have to live with myself, and so,
I want to be fit for myself to know,
I want to be able, as days go by,
Always to look myself straight in the eye,
I don't want to stand with the setting sun,
And hate myself for the things I've done.

Mr. Chairman, I move that one copy of this tribute be inserted in the permanent records of the Association, and one copy be sent to the family of each deceased member.

CHAIRMAN KINSLEY: Gentlemen, you have heard the motion. What is your pleasure?

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

. . . President Robinson resumed the chair. . . .

PRESIDENT ROBINSON: That concludes the morning session. The afternoon session will convene at 1:30 o'clock.

. . . The session adjourned at 11:40 a. m. . . .

RECESS
The second session convened at 1:55 p. m., President Robinson presiding.

PRESIDENT ROBINSON: Gentlemen, we will please come to order. The afternoon session, as you see by the program, is devoted to Bang's disease. However, before we start in with the program, Dr. Kinsley has a resolution to present.

DR. A. T. KINSLEY: Mr. President and Gentlemen: We all enjoyed very much Dean Davis' paper this morning. The portion on vivisection concerns the veterinary profession, sanitary officials and regulatory officers; in fact, all of us. A resolution has been prepared that I trust will meet with your approval.

RESOLUTION

WHEREAS, Animals have contributed such a wealth of scientific knowledge for the relief of suffering to both animals and man, and

WHEREAS, In the control of epidemics, both in animals and man, experiments on the lower animals, especially the dog, have resulted in definite advances and progress which could not be attained otherwise, and

WHEREAS, The progress in surgery is largely dependent upon experiments properly conducted under anesthesia, and

WHEREAS, Animal experiments are used to standardize practically all medicines, drugs and serums administered to animals and man, and

WHEREAS, An active campaign has been and is being promoted by certain individuals and groups opposed to experimentation on lower animals, particularly the dog, and

WHEREAS, We feel that such interference with scientific experiments will result in impeding progress in the prevention and cure of disease in animals and man, therefore be it

Resolved, That the United States Live Stock Sanitary Association go on record as condemning any legislation prohibiting the use of animals for such experimental purposes, and that a copy of this resolution be forwarded to the Secretary of the American Veterinary Medical Association and to the secretary of each state veterinary association.

DR. KINSLEY: I move the adoption of this resolution.

DR. C. P. FITCH: Mr. President, I deem it a privilege to be allowed to second this resolution. It has been my sad experience to go through some of these legislative drives to prohibit what they are pleased to call vivisection which is, to my knowledge, a nonentity in this country. The limits to which some misguided people will go in order to bring about certain legislation which they believe is for the benefit of our dumb creation are inestimable. If time permitted, I should be glad to recount to you certain of these items which they bring up, for which there is no truth and for which there is no foundation. We must recognize that we have to fight this movement at every place and every time it appears.

I hope this resolution will prevail unanimously.

DR. MUNCE: Mr. Chairman, I am not in any way in opposition to the motion but I think, under the Constitution and By-laws, that this resolution should go to the Executive Committee.

DR. KINSLEY: I move that it be referred to the Executive Committee.

PRESIDENT ROBINSON: It has been moved and seconded that this resolution be referred to the Executive Committee. All those wishing to vote in the affirmative will say "aye"; those opposed, "no." The "ayes" appear to have it; the "ayes" do have it, and it is so voted.
Now we will proceed with the first paper which is by Dr. K. F. Meyer, of the George Williams Hooper Foundation, University of California, and Dr. J. C. Geiger, of the Department of Public Health, City and County of San Francisco, California, entitled, "The Increasing Importance of Brucelliasis as an Occupational Hazard." I understand Dr. Meyer is not here, but the paper will be read by Dr. R. E. Lubbehusen.

DR. LUBBEHUSEN: Mr. President and Members: I am sure that those of you who have had the pleasure of hearing Dr. Meyer on previous occasions will be disappointed that he is not here to present his own paper, or rather, I should say, papers; there are two.

Dr. Lubbehusen read the paper by Dr. Meyer and Dr. Geiger on "The Increasing Importance of Brucelliasis as an Occupational Hazard," and the one by Dr. Meyer and Dr. B. Eddie, on "The Problem of Caprine Brucella Infections in the United States." . . . (Applause.)

THE INCREASING IMPORTANCE OF BRUCELLIASIS AS AN OCCUPATIONAL HAZARD*

By K. F. MEYER* and J. C. GEIGER†
San Francisco, Calif.

Epidemiologists have for a number of years made the observations that (a) a percentage of persons exposed to infection by Brucella abortus or Brucella suis show either agglutinins or complement-fixing antibodies in their sera and (b) clinical undulant fever is relatively infrequent in the occupational groups who come continuously in intimate contact with the Brucella organisms. Various explanations have been offered. Thus it was believed that the Brucellas of certain types were incapable of infecting human beings unless the resistance of the individual was lowered or that only strains of exceptional invasiveness may attack man, or that massive dosage on repeated occasions was essential. Ample data have been presented to disprove these interpretations.

Experimental and epidemiologic observations collected during the past five years leave no other explanation than that Br. abortus, and in all probability Br. suis and Br. melitensis as well, are organisms endowed with a moderate degree of virulence which rather frequently infect persons who are exposed either by contact through the skin or by the alimentary route. These infections generally remain latent. Their existence may be determined under varying conditions by certain antibodies, a cutaneous or general specific allergy, an intensified phagocytic activity of the polymorphonuclear leucocytes, or by the demonstration of

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†Department of Public Health, City and County of San Francisco.
the organisms in the blood and urine. In a small percentage of persons so infected temporary indefinite clinical disturbances may be noted. These cases of brucelliasis fall outside the concept of true undulant fever. The evidence at hand indicates that clinical symptoms, either with brief (Leavell and Amoss) or prolonged illness, prostration and death develop in a small proportion of persons who received one or repeated massive doses of organisms or who had suffered a temporary or more lasting diminution in their resistance.

Since the morbidity statistics on undulant fever are notoriously incomplete, it is impossible to offer a reliable estimate relative to the proportion of frank cases of undulant fever to latent infections. The serologic surveys which have been made in the United States, Sweden, Germany and Great Britain, on select samples of serum which were submitted for Wassermann tests, merely permit the conservative estimate that approximately 1 per cent of the population suffers annually from clinical or latent brucelliasis (Habs). Somewhat more instructive are the detailed serologic studies which have been made on occupational groups exposed to Brucella contact infections. Employés of slaughterhouses, of the dairy trade, of stock farms and groups of veterinarians have been tested. The most important data are summarized in table I.

| TABLE I—Serologic examinations of persons exposed to contact infection with Brucella organisms. |
|----------------------------------|------------------|------------------|
| Observers:                      | TOTAL | Positive Reactions |
| Dible and Poxnall               |       |                  |
| Hardy et al.                    |       |                  |
| Jordan, Huddleson et al.        |       |                  |
| Knoth, Martin and Myers         |       |                  |
| Meyer and Eddie                 |       |                  |
| Sadowski, Thomsen               |       |                  |
| Packing-house employés: Slaughterers | 1,618 | 269 16.60 |
| Veterinarians:                  |       |                  |
| U. S. A. and Germany            | 491   | 148 30.00 |
| Denmark (Thomsen)               | 18    | 11 61.10 |
|                                | 11    | 3 27.27 |

The figures conclusively show that veterinarians, slaughterhouse employés and farm workers, whose occupations bring them in frequent and probably continuous contact with infective material, become infected with *Br. abortus*. The percentage of
these infections in the different groups is quite variable, although the average of 18.4 per cent for the slaughter-house employés in Iowa, Michigan and Nebraska corresponds well with that determined in San Francisco. On the other hand, the data dealing with the veterinarians show considerable varieties. The high percentage of latent infections, as determined by Thomsen, must be largely ascribed to the necessarily intimate exposure of the Danish veterinarians while treating cattle for sterility according to the method of Albrechtsen. Significant is the fact that 115 employés of several milk-distributing plants handling pasteurized or raw milk from Bang's disease-free herds revealed, by serologic tests, no latent infections. In this connection it must be emphasized that the serologic procedure to detect latent infections is doubtless unreliable. The duration of the agglutinins in the manifest or latent cases of brucellosis is not known for the individual cases. In some patients the agglutinins disappear rapidly from the blood while in others relatively high titres are obtained a year or more after subsidence of symptoms. Neither the agglutination nor the complement-fixation test furnishes a true picture of the number of latent infections in an occupational group.

These and similar deductions prompted the introduction of the allergic skin tests. One characteristic feature which distinguishes the patient recovered from an attack of undulant fever is the increased vigor with which he reacts to contact with the specific antigen. This fact has been demonstrated by numerous workers but the observations have not been extended to a great many cases since the allergic skin test is a procedure which has been introduced into the clinical armamentarium only in recent years (Fleischner and Meyer, 1917; Burnet, 1922; Appieto, Leavell and Amoss, Levin, Huddleson and Johnson, Thomsen, Dubois and Sollier, Jeckel and Chapman, Staube, Wichels and Von Gara, Larche and Roth, Dacey and Korovin, and others). Although specific, the allergy develops slowly and the test therefore cannot replace the blood culture and the agglutination test. Dubois and Sollier (1931) and others encountered patients with positive blood cultures or serum reactions but negative skin tests. In the experience of Meyer and Eddie, delayed and mild skin reactions indicate the prospect of a prolonged illness and slow recovery. Such patients react poorly to biologic shock treatment.

Data collected in San Francisco on occupational groups exposed to Brucella infections have shown that a very high percentage of persons are allergic to "brucellin." Important are the
observations that the percentages of positive skin reactions are much higher in packing-house employés who are in continuous and intimate contact with infected raw meat than those who are less frequently exposed. The data selected at random are as follows:

**Butchers**

- Beef-killing, 14; 13 or 92.1 per cent reactions
- Hog-killing, 26; 18 or 69.2 per cent reactions

**Sausage Manufacture**

- Casing, 20; 15 or 75 per cent reactions
- Sausage, 23; 6 or 26 per cent reactions

**Butterine**

- 6; 0 reactions

**Wool House**

- 17; 4 or 23 per cent reactions

Tests on dairy workers engaged in the handling and distribution of pasteurized and raw milk revealed 16.5 per cent allergics. According to previous histories the reacting persons had served either as farm hands or milkers on dairies with a known history of Bang's disease. Not one of this group had agglutinins or complement-fixing antibodies in the blood. Positive serum reactions were elicited in the packing-house employés in from 10 to 23 per cent of the personnel examined. A specific sensitization to the Brucella allergin is obviously a widely distributed state among those who have had an opportunity to come in contact with these bacteria. Although the allergic skin test is a much more sensitive method of recognizing the existence of latent infection, it is probably not sufficiently sensitive to detect every past subclinical infection for the following reasons:

Skin allergy is probably a variable state and to some extent influenced by the particular occupational activity. Some observations, as yet incomplete, suggest that the derma of women employed in a casing department, having had their skins continuously exposed to strong brine or lye solutions, may give negative "brucellin" skin reactions even though the serologic and phagocytic tests strongly indicate the existence of latent infections. In view of the brilliant studies by Rich and others, it is fully recognized that a state of allergy is not always indicative of immunity or the residual of a latent infection. Nothing is known concerning the duration of the skin allergy in Brucella infections. It appears not unlikely that continuous contact with the allergin is necessary in order to maintain the hypersensitivity at a high level. In view of the epidemiologic findings re-
ported in recent years, it is unreasonable to believe that over 50 per cent of the veterinarians or packing-house employees who have for years been exposed to Brucella, escaped a latent infection and since they give no skin test are not immune. *With the aid of the skin tests one may recognize the allergic but not necessarily the latent infected and immune human being.*

The opsono-cytophagic or phagocytic index tests recently introduced by Huddleson, Johnson and Hamann evaluate the enhanced phagocytic activity of the polymorphonuclear cells of whole citrated human blood. It is a simple and exceedingly valuable means of evaluating the responses of the host to the parasite. A low phagocytic activity is evidence of susceptibility to Brucella infection, while a high index would express immunity.

By recording the allergic skin tests and phagocytic power of the blood, a series of 388 employees of the San Francisco meat production and packing departments were tested. Based on the reactions recorded, the employees could be classed into four groups:

1. Skin test and phagocytic index positive.
2. Skin test positive and phagocytic index negative.
3. Skin test negative and phagocytic index positive.
4. Skin test and phagocytic index negative.

If the phagocytic index expresses immunity to Brucella then the deduction that the person acquired this state of protection in the course of his occupational activity through a latent infection is justified. That an immunity may exist without a skin allergy has already been mentioned. Eighty-one persons, or 20 per cent of the entire occupational series, gave negative skin tests but phagocytic indices varying from 2.12 to 17.68. At least eight of these agglutinated Brucella in dilutions of from 1:40 to 1:80. In group 2 were placed 63 employees who gave definite and pronounced allergic skin tests but phagocytic indices below 1.0. According to the interpretation of Huddleson, these individuals were in a state of active infection at the time the tests were made. Such a possibility cannot be denied, since these individuals belonged to the most severely and continuously exposed occupational group. However, it must be remembered that the phagocytic activity of an individual is subject to considerable fluctuation and a single test may not reflect the average physiologic power of the leucocytes.

These preliminary survey studies emphasize that the combined serologic, allergic and phagocytic tests apparently furnish an approach for estimating the degree of latent infection in a group. With the combined tests it is shown that 73.4 per cent
of the personnel connected with the meat-packing industry in San Francisco has had contact with the Brucella organisms. In fact the percentage in the groups which are most intimately exposed, such as the butchers and tallow workers, is as high as 91 to 95 per cent. Doubtless, these figures reflect more definitely than the agglutination or the skin test the degree of latent infection and help to explain the relative infrequency of clinical undulant fever despite continuous exposure.

The tacit assumption has been made that an individual who fails to give a serologic reaction, negative skin and phagocytic tests, may be susceptible, while a positive allergic or phagocytic reaction is indicative of acquired resistance. A continuous supervision of the employés has shown that these deductions are correct. Several employés who, according to the various tests, were considered susceptible, contracted in from two to ten months clinical undulant fever with positive Br. suis blood cultures. In two instances the immunity conferred by a latent infection was tested by subjecting the individuals experimentally to cutaneous infections with Br. melitensis. Aside from a pronounced local allergy no reactions were recorded.

With increasing frequency Br. suis undulant fever has been recognized in the packing-plants of the West. During eight months, in one establishment alone, eight cases have been diagnosed in a group of approximately 500. The state insurance commissions have become alarmed. They are unwilling to accept the present-day conclusions that the packing-house employés must accept undulant fever as an occupational hazard and protect themselves as best they may by avoiding infections of raw meat products. Until the factors responsible for the serious menace to health by Brucella-infected meat or animal products are definitely understood, a practical control of these sources of danger many not be achieved. It is doubtless advisable to exclude those who are susceptible from those occupational activities which are particularly hazardous. On the other hand, every effort should be made to protect the non-immune by enhancing their resistance.

There have been published numerous attempts by English (Wright, Eyre) and French workers (Burnet, Nicolle and Conseil) to confer to human beings, by means of various types of killed vaccines, an immunity against melitensis or abortus infection. The more recent studies along this line by Dubois and Sollier merely confirm the previous observations. A state of allergy or an enhanced phagocytic activity is not produced and in consequence no protection, theoretically, can be expected. There
is absolutely no experimental proof that heat-killed or chemically prepared vaccines are capable of conferring the least degree of protection. (A bacteriologist injected with a heat-killed vaccine contracted a severe attack of Malta fever one and one-half months after exposure to Br. melitensis.)

Immunization experiments with avirulent (for guinea pigs) Brucella strains on monkeys are equally discouraging. The animals repeatedly injected with the live cultures and subsequently tested by the cutaneous route with Br. melitensis became infected as indicated by slight febrile reactions and positive blood cultures. However, the possibilities of preventive immunization have not been exhausted. While these investigations are now in progress every effort should be made to secure accurate information concerning the mechanism of latent infection and the methods of their recognition. It is equally important to determine the incidence of milk-borne Br. suis infections in order to decide conclusively the reasons for the constant isolation of the porcine type of Brucella from the blood-stream of packing-house employés.

THE PROBLEM OF CAPRINE BRUCELLA INFECTIONS IN THE UNITED STATES*

By K. F. MEYER and B. EDDIE

George Williams Hooper Foundation
University of California, San Francisco, Calif.

Sporadic cases of undulant fever have occurred in Texas since 1887 and in Arizona and New Mexico since 1890, according to information collected by Tappan. The disease was not suspected as such at the time and hence was not reported. It may have been introduced by finely bred Angora goats from Asia Minor in 1867 by Harris. Spanish, Maltese and the more recent importations from South America also may have contributed to the endemic infection of the goat herds in the Southwest. An investigation among goat-herders in Texas by Ferenbaugh, and Gentry and Ferenbaugh in 1911 showed that undulant fever was prevalent. In view of their findings Dr. E. S. Godfrey, State Health Commissioner of Arizona, made the disease a reportable one and issued a warning to all physicians in the state to be on the lookout for the infection, especially among goat-herders, of whom there were a considerable number.

*These studies have been aided by grants from the E. Charles Fleischner Endowment Fund.
Subsequent studies by Yount and Yount and Looney led to the discovery of five cases in Arizona. The clinical symptoms of the disease were confirmed by laboratory tests. Additional cases were reported during the next ten years but the seriousness of the situation was appreciated only when Watkins and Lake, in 1922, discovered 35 cases in epidemic distribution among 400 to 500 people who had consumed goats' raw milk over a period of four months at Phoenix, Arizona. That conditions are favorable for the existence and spread of undulant fever in the entire southern area is furthermore indicated by the reports of cases by Wellman, Eustis and Schochet in Louisiana and by Woolsey in Missouri, which apparently originated either in Mexico or in Texas. The untimely death of the State Veterinarian due to a melitensis infection contracted through the handling of an infected afterbirth of a goat established, in 1923, the endemic existence of Malta fever in southern Utah (Tyndale and Viko). According to recent reports an extensive focus has been discovered in the southwestern corner of this state.

A number of developments, which took place during the first quarter of 1927, left no doubt that the undulant fever problem in the West required detailed investigation. In January, 1927, the Hooper Foundation was requested to examine a specimen of blood serum secured from a patient (physician) living near Morenci, Arizona. The serologic absorption test of the highly active blood sample indicated an infection with Brucella melitensis. Two blood cultures in ordinary glucose broth and shipped 1,000 miles gave abundant growth of a strain of Brucella, serologically a melitensis type A, which produced bovine-like lesions on injection and on feeding to guinea pigs. No definite source of infection could be determined although authenticated information stated that the patient never drank goats' milk, nor had he ever come in contact with goats. However, he admitted occasional consumption of raw cows' milk.

The possibility, therefore, existed that in Arizona true melitensis strains may be disseminated in cow's milk. This suspicion was further fortified when another melitensis culture was secured from a patient who had consumed cows' milk before he became ill and was transferred to one of the veterans' hospitals in the South. At the same time, in answer to the prevailing sentiment that the Texas-New Mexico-Arizona goat-raising districts may have been responsible for the increase of undulant fever in the United States, an investigation appeared equally imperative. Simultaneously, another question arose: Are the caprine infections in these regions true melitensis infections?
Experimentally, goats are known to be susceptible to the abortus varieties. Without a detailed bacteriological analysis of strains recently isolated directly from goats, this question could not be answered.

Serologic tests conducted by Gentry and Ferenbaugh in Texas, as early as 1911, had shown that 25 (19.4 per cent) of a total of 128 goats in four different herds gave positive agglutination reactions for *Br. melitensis* in a dilution of 1:20; later Lake found 21 (18.3 per cent) reactors in a herd of 115 goats, while more recently Holt and Reynolds classified 189 goats (16.7 per cent) of 1,130 animals from Texas, New Mexico and Arizona as positive for "melitensis." According to the published records, three different procedures have been used: the microscopic, the macroscopic and the fixation tests. The data are therefore not comparable.

Whether or not absorption tests have been made is not stated. It is not generally known, but Holt and Reynolds isolated, according to their description, *Micrococcus melitensis* from ten blood specimens of 1,097 goats and found the same organism in four samples of milk, the total samples numbering 615. No record of these cultures is available nor have they reached the various laboratories engaged in a comparative study. Caprine Brucella strains of American origin were not available as late as 1930.

Irrespective of the many epoch-making observations and studies on the nature of the Brucella infections of goats by the British Commission (Reports of the Commission for the Investigation of Mediterranean Fever, Parts I to VII, London, 1905 to 1907*) and in particular by Zammit and later by Burnet, a number of pertinent questions have arisen in the light of the recently acquired knowledge. Abortion as the most important symptom was first mentioned by Dubois in his report to the French authorities in 1911. Subsequently, Mohler and Eichhorn and Della Vida report that when an infected goat is introduced into a healthy herd in an uninfected district, the disease rapidly becomes epidemic and subsequently endemic. In the early days of this endemicity abortion is noted and it is often the only sign of the presence of the disease.

As late as 1925, Eyre, a former member of the British Commission, expresses considerable doubt concerning the abortive properties of *Br. melitensis*. To be sure, the British Reports

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*These reports should be consulted by every investigator of Brucella infections.*
and the lucid summaries by Bassett-Smith on the subject of Malta fever in goats are singularly free from any detailed statement concerning abortions. To quote from the Report of the Commission for the Investigation of Mediterranean Fever, Part IV, 1906, page 47: "Pregnancy goes on uninterruptedly in infected goats; a miscarriage was reported only in one instance."

Moreover, in anticipation of a rational veterinary control of this infection, it is not only desirable but imperative that further information be collected relative to the clinical course, the autopsy and the cultural findings. The histories of Zammit, Burnet and Anderson, Spagnolio and Huddleston cover a total of 21 infected goats.

**Survey of Goat Herds in the Southwest**

Through the continuous cooperation of Miss Jane Rider, of the State Board of Health of Arizona, Dr. C. T. Guilfoyle, State Veterinarian, and Dr. M. Shipley, of Phoenix, the Hooper Foundation has been able to secure infected goats and transfer them to San Francisco for a careful study as early as 1930. As a preliminary survey five goat herds, varying in size from 100 to 1,700 animals were tested by serologic methods. Since it was impracticable to test every goat, it was decided to examine the blood of a small percentage (5 to 10 per cent of the herd). If lactating, a sample of the secretion from both mammae was taken in 50 per cent glycerin. The milk was cultured on gentian-violet plates and the cream and sediment were injected into guinea pigs. The results obtained are shown in table I.

One herd with a very small percentage and two herds with histories of abortions furnished blood sera which failed to agglutinate either *Br. abortus* 80 or *Br. melitensis* 428 in dilutions above 1:40. In the herd F. F., the serum of two (4 per cent) of the animals tested reacted in dilutions of 1:50 to 1:1,280, and in the fifth herd 16 per cent reactors of 1:80 and higher were determined. The whey tests of the first four herds were entirely negative. In the fifth herd, five of nine pooled milk specimens gave positive reactions. The whey clumped *Br. abortus* and *Br. melitensis* in dilutions of from 1:20 to 1:160 and even 1:640. Three goats with agglutination titres varying from 1:160 to 1:2,560, and two with titres of 1:40 to 1:80 from herd W.W. and one with a titre of 1:1,280 from herd F.F. were purchased and shipped under proper isolation—with the permission of the State Department of Agriculture—to San Francisco.
<table>
<thead>
<tr>
<th>Herd</th>
<th>History and Condition</th>
<th>No.</th>
<th>%</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. F.</td>
<td>Infected: Owner had undulant fever, 1928</td>
<td>10</td>
<td>20.0</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Abortions: 1928, 15%; 1929, 20%; 1930, 13%</td>
<td>32</td>
<td>64.0</td>
<td>1:20 = to ++</td>
</tr>
<tr>
<td></td>
<td>Tested: 50 animals of herd of 100 Angora</td>
<td>3</td>
<td>6.0</td>
<td>1:20 ++++</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>6.0</td>
<td>1:40 ++++</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>4.0</td>
<td>&gt;1:50 ++ ++ +; 1 animal, titre 1:1,280; positive milk</td>
</tr>
<tr>
<td>R. D.</td>
<td>Old infection:</td>
<td>17</td>
<td>42.5</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Abortion: 1928, 70; 1929, 50; 1930, 15</td>
<td>19</td>
<td>47.5</td>
<td>1:20 = 97.5% negative or 1:20 100% &lt;1:50</td>
</tr>
<tr>
<td></td>
<td>Total herds: 1,700 Angora 600 kidding</td>
<td>3</td>
<td>7.5</td>
<td>1:20 ++++</td>
</tr>
<tr>
<td></td>
<td>Tested: 40 animals</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>R. B.</td>
<td>Abortions: 1927, 150; 1928, 360; 1929, 200; 1930, 100</td>
<td>10</td>
<td>40.0</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Total herd: 1,000-2,000; at present 1,000 Angora</td>
<td>15</td>
<td>60.0</td>
<td>1:20 = -+++ 100% below 1:50</td>
</tr>
<tr>
<td></td>
<td>Tested, 25 animals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W.</td>
<td>Infected: Abortions: 1927, 150; 1928, 360; 1929, 200; 1930, 100</td>
<td>17</td>
<td>14.0</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Several human infections since 1928; at least 4 herders</td>
<td>72</td>
<td>59.5</td>
<td>1:20 = to +++ + + + + + + + 84% below 1:50</td>
</tr>
<tr>
<td></td>
<td>Total herd: 1,000 in band observed</td>
<td>13</td>
<td>10.9</td>
<td>1:40 ++++</td>
</tr>
<tr>
<td></td>
<td>Tested: 121 animals</td>
<td>10</td>
<td>7.5</td>
<td>1:80 ++++</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>8.3</td>
<td>&gt;1:60 to 1:2,560 16% (2 animals with positive milk)</td>
</tr>
<tr>
<td>F. B.</td>
<td>Abortions: Very small percentage</td>
<td>7</td>
<td>16.6</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Total herd: 800 Angora</td>
<td>34</td>
<td>80.9</td>
<td>1:20 = to +++ + + + + + + + + 97.5% negative</td>
</tr>
<tr>
<td></td>
<td>Tested: 42 animals</td>
<td>1</td>
<td>2.5</td>
<td>1:40 +++ + + + + + + + 100% below 1:50</td>
</tr>
</tbody>
</table>

Total sera tested: 278
Upon arrival the examination of the goats revealed animals which, aside from ectoparasitism, were in excellent health. Two were accompanied by kids and four were giving varying amounts of milk. The temperatures recorded twice daily remained, with slight fluctuations, within the normal range. Milk specimens collected aseptically were cultured and blood cultures were taken. Goat 2 was found to discharge in the secretion of the right mamma a large number of Brucella-like organisms, while goat 26 furnished positive blood cultures on two successive tests several days apart. In this connection, it should be noted that only the cultures made with 1 cc of blood on solid mediums gave positive results. One or two colonies developed on one slant cultured from each goat. The serum-like secretion from the left half of the udder also gave positive cultures.

On autopsy, goat 26 presented a slightly enlarged spleen, indurated and enlarged supramammary lymph-nodes, an obstructed right teat-canal, and a focal interstitial mastitis. Cultures of Brucella were recovered from the spleen, udder and supramammary lymph-nodes. The diffuse growth on some of the tubes streaked with fragments of the glands and nodes was most striking. The serum titre remained at 1:5,000 for two weeks.

Goat 2 continued to discharge specific bacilli irregularly during several months. The actual counts of the milk varied from four to 350 per cc. Shortly after the udder secretion had dried up the serum reaction declined and at the time of the autopsy, six months after the goat had been recognized as a carrier, the reaction was 1:80. Although a searching study was made of the tissues, no Brucella could be detected. The gross and microscopic lesions were essentially negative.

Rather disappointing were the bacteriological studies on two goats with agglutination titres of 1:80 to 1:320. A detailed examination failed to reveal any significant gross lesions. Several hundred cultures on liver and blood-agar prepared in quadruplicate from every section of organ and lymph-node were found free from Brucella-like organisms. One of the goats with a serum titre of 1:20 gave equally negative bacteriologic findings. Her kid developed normally and has not shown agglutinins in the blood-serum.

In 1933, two additional herds were examined. The first consisting of 15 animals was of particular interest since three human milk-borne infections were traced directly to one of the diseased goats. Of six adult milking goats four reacted in dilutions of 1:640 to 1:1,280. Three young goats gave definite reactions (1:40 to 1:160), which became negative by the time they
had been transferred to the laboratory. From three of the reacting goats typical melitensis strains were isolated from the milk or the lymph-nodes and the udders. Two animals were lame but no definite arthritis was demonstrable at autopsy.

The milking goats of another herd were sampled in June, 1933. Of 14 animals, two gave reactions in dilutions of from 1:1,600 to 1:3,200, while two others reacted in dilutions of 1:40 to 1:80.

A culture isolated from a pooled milk sample obtained from another goat herd, which caused one human infection, was submitted for identification. It was identical with the strains previously obtained from goats.

Through the co-operation of Dr. O. E. Puckett, Health Officer of Eddy County, Carlsbad, New Mexico, two large mohair goat herds in the Guadaloupe Mountains were tested early in 1934. In a group of 25 blood specimens, two reacted in dilutions of 1:160 and 1:320, respectively. In another series of 51 goats, the following reactions were recorded:

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Count (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:50</td>
<td>28 (54.9%)</td>
</tr>
<tr>
<td>1:50</td>
<td>23 (45.1%)</td>
</tr>
<tr>
<td>Negative</td>
<td>11 (21.56%)</td>
</tr>
<tr>
<td>1:20</td>
<td>4 (7.84%)</td>
</tr>
<tr>
<td>1:40</td>
<td>13 (24.84%)</td>
</tr>
<tr>
<td>1:80</td>
<td>2 (3.92%)</td>
</tr>
<tr>
<td>1:60</td>
<td>6 (11.76%)</td>
</tr>
<tr>
<td>1:320</td>
<td>15 (29.41%)</td>
</tr>
</tbody>
</table>

A culture isolated at autopsy from the supramammary lymph-node of one of the goats was identified as \textit{Br. melitensis}.

Quite recently a more extensive survey covering several states has been instituted. The data thus far obtained with the rapid agglutination test on 2,500 goats would indicate that approximately 1 to 4.8 per cent may be infected with \textit{Br. melitensis} provided this test is dependable when applied to emaciated animals.

**CAPRINE BRUCELLA CULTURES**

A detailed bacteriological analysis of the nine separate cultures secured from the goats immediately after their isolation furnished the following facts: Aerobic growth within 72 to 96 hours; \( \text{CO}_2 \) inhibits slightly; small coccus type with tendency to ovoid cells constantly reverting to coccus type on Filde's media; no \( \text{H}_2\text{S} \) within three to four days; acid in galactose, arabinose or xylose; slightly tolerant to thionin or pyronin; serologically they fall into group VI, \textit{Br. melitensis} var. \textit{melitensis} A; highly virulent for guinea pigs; 140 to 300 organisms
injected intraperitoneally produce within six weeks anatomical lesions resembling those induced by the bovine abortus; in 50 per cent of the animals the bacilli were isolated from the urine and kidneys; febrile reactions in monkeys injected cutaneously or subcutaneously. One single feeding of 150 million caused a non-febrile disease; repeated feeding of naturally infected milk stimulated agglutinin production on the 51st day; several human laboratory infections followed the introduction of this strain into the laboratory. In hogs the organisms caused a septicemic disease of varying duration but ultimate autosterilization of the tissues.

In view of the facts just enumerated, it may be concluded without any fear of contradiction that the goat infections in the Southwest of the United States are caused by typical caprine-melitensis types of the Brucella group. It is reasonable to assume that the same organisms are involved in the endemic areas throughout the territories of New Mexico and further east in the Nueces and lower Pecos River counties of Texas. A comparison with the cultures isolated from human cases of undulant fever reveals that they are identical in all respects.

**NATURE OF LATENT INFECTIONS AND THEIR EPIDEMIOLOGIC SIGNIFICANCE**

The milk of the goats, which reacts in the agglutination test in dilutions above 1:320, contains the Brucella organisms in large numbers. Their presence can be demonstrated by direct plate culture and by inoculation tests on guinea pigs. It appears to be practical to ship infected milk preserved in glycerin or boric acid (Traum's method). Clinically the infections may run an unrecognized course but it is quite certain that a systematic survey of a herd would reveal a fair percentage of diseased udders and the existence of animals in a septicemia stage of infection. Holt and Reynolds obtained positive blood cultures in 0.9 per cent of the 137 serum-positive goats examined. The Brucella organisms persist longest in the udder, the supramammary and occasionally the iliac lymph-nodes. In one instance the abscessed uterine glands contained *Br. melitensis*. This observation deserves further investigation.

The herd records stress the existence of abortions, varying from 10 to 20 per cent. Conclusive proof that the Brucella organisms are responsible for the interruption of the pregnancies could not be secured from the few placentas which were collected in the different herds at the time the blood specimens and milk samples were collected. Neither specific lesions nor organisms
could be demonstrated by direct culture or by animal inoculations. The nature of the genital disease remained, therefore, a matter of conjecture until a series of infection experiments established conclusively that the caprine-melitensis may cause a catastrophic termination of the pregnancy.

Of seven goats infected by the oral, conjunctival or subcutaneous route, four aborted in the third to the sixth month of pregnancy, 17 to 30 days after the administration of the caprine-melitensis strains. One goat was sacrificed in order to study the anatomical lesions, which consisted of a specific chorion placentitis and purulent endometritis. The remaining two goats gave birth to full-term dead fetuses with specific involvement of the placentas. These conclusive experiments established the high virulence of the caprine-melitensis strains. A relatively small inoculum of one loopful of culture induced an extensive and destructive genital disease.

Just as in cattle, active multiplication takes place within the epithelial cells of the chorion (Theobald Smith) of the fetal membrane and thence spreads between the chorion and the uterine mucous membrane. This proliferation is the cause of a purulent endometritis. There are also indications that the epithelium of the fetal placenta may become involved and that the intercotyledonous spaces of the chorion may be secondarily affected.

Any one who has examined the fetal envelopes, profoundly and diffusely impregnated as they are with billions of melitensis organisms, will be convinced that they represent the most potential source for cutaneous infections. Also the prolonged (41 days) elimination of the specific organisms in the vaginal discharge accompanied by intermittent elimination in the urine as well as the constant secretion in the milk of many hundreds, even millions, of specific germs makes such an animal a most dangerous reservoir of infection. Herds with aborting goats doubtless contaminate their surroundings, as for example, the dusty bedding grounds so commonly seen in the desert country. Various unsuspected routes of infection other than milk thus suggest themselves as sources of undulant fever for man.

COWS' MILK INFECTED WITH BRUCELLA MELITENSI

Even more disconcerting is the fact that the association of cattle with goats in the endemic areas may lead to a transfer of Br. melitensis to cows. In a small community of a state in the Southwest, a six-year-old girl developed a typical attack of undulant fever with a high serologic response. When brought to
the hospital, it was found that her mother suffered from the same malady in a mild form. Consumption of goats' milk or contact with the goat industry was absolutely excluded. The cream and sediment of the milk of one of the dairies, which had furnished the milk to the family, produced lesions in guinea pigs from which a Brucella organism was isolated. This strain produced little or no H$_2$S, grew freely without CO$_2$, reacted in the dye, nitrate and serological tests like a typical melitensis and grew persistently as a coccus on Filde's medium. It infected goats in a manner characteristic for this type. Similar observations have recently been reported by Parisot, Vidal and Lévy,$^{61}$ Gilles, Pérès and Culty,$^{42}$ and Taylor, Vidal and Roman$^{54}$ in support of the earlier records of Giugni,$^{43}$ Balozet and Reynal$^9$ and others. The infectiousness of cows' milk with Br. melitensis seems to be quite high, since in Balozet's epidemiologic inquiry at Tunis, four human cases were connected with a dairy of 37 cows.

In the light of the increasing importance of the sheep as a source of undulant fever in southern France and other regions, it is desirable to inquire into the possibility that this species, through its intimate association with goats in the Southwest, may become infected. Preliminary studies on several hundred sheep have thus far failed to furnish conclusive facts which would support this suspicion.

**IS CAPRINE BRUCELLIASIS A SELF-LIMITING DISEASE?**

As conservative an investigator as Zammit$^{85}$ has expressed the opinion that goats naturally infected never recover. Certain observations made by Burnet and Anderson$^{30}$ and subsequently also noted by us cast some doubt on this general conclusion. Several goats naturally or experimentally infected, some with high agglutination titres, positive blood and milk cultures, held under observation for from 88 to 325 days, not only lost their agglutinins but at autopsy, despite detailed and painstaking cultural examinations of every lymph-node and sections of the mammae, yielded no Br. melitensis colonies. To dismiss these results with the assumption that it is obviously impossible and difficult to culture every minute bacterial focus is not justified. Suffice it to recall that, by comparison, naturally as well as experimentally infected goats, held under observation for from 325 to 440 days, revealed by culture their latent infection in the udder and the lymph-nodes.

Recovery and bacteriological sterility of the tissues in a certain percentage of goats selected from herds in the endemic
areas and others obtained from Malta fever-free districts appears as fully established. These animals are remarkably resistant to reinfection and are capable of removing from their tissues enormous numbers of Brucella within two to three months. The immunity of these goats is in part expressed by a pronounced phagocytic activity of their leucocytes as determined by a special method and by a very marked general and local allergy. A casual perusal of the meager epidemiological data concerning bruceliasis of goats, which are available, supports the scattered observations on individual goats.

It is reasonable to suspect that in a goat herd in which only 15 to 20 per cent serum reactors are detected, a great many animals are immune as a result of a mild, abortive, autosterilizing infection. One of the most urgent problems, which confronts the investigator, deals with the determination of the susceptibility or contagion index of various animals for the Brucella organism. The course of a Brucella infection in a herd has been analyzed merely with the aid of the serological tests. Other methods must be employed in order to detect the immunizatoric processes which are constantly in progress. Thus an explanation may be found for the peculiar stationary percentage of latent Brucella infections in the goats of Tunis, the island of Malta, etc., which varies between 5 and 12.

As far as a limited number of observations would indicate, there seems to be a marked difference between the reaction of the goat to the bovine, porcine and melitensis organisms. Nothing in other species like the malady produced in goats with the Malta fever organism has been observed. There is no reason to deny the generally accepted fact that this type is the Brucella organism, par excellence, of the goat and sheep. Whether it is a strictly specific virus despite its remarkably close serological and biological relationship to the abortus remains a fascinating and yet unsolved problem. Goats injected with moderate dosages of suis or bovis types of Brucella readily recover and sterilize their tissues completely.

VETERINARY CONTROL MEASURES

The meager and, in part, incompletely understood information concerning the epidemiology of Malta fever in a goat herd precludes at this time the presentation of an intelligent program of eradication or control. Future investigations must be directed towards a critical evaluation of the methods suitable for the detection of the carriers of Brucella organisms and a practical procedure in preventive immunization.
(1) The agglutination or complement-fixation test may be useful provided repeated tests are made. However, the observations of Zammit, Dubois and Sollier as well as our own have shown that even negative reactions obtained in blood specimens at 15- to 30-day intervals never preclude the possibility that the goat is not infected, and a potential shedder of bacilli. The serum reactions may remain persistently negative, despite a very heavy infection revealed at postmortem. In view of the doubtful reliability of the serum test it is obviously impossible to consider a reaction in a dilution of 1:40 and above as an index of a latent infection, provided the goat lives in an endemic area. The reasonableness that a goat with a serum reaction of 1:20 possesses a latent infection in a flock with a previous history of Malta fever is amply supported by many recent observations. In this connection, the reports by Dubois and Sollier on sheep and goats deserve consideration. Infected animals are more apt to give positive serum reactions provided the examinations are made during pregnancy than immediately after abortion.

The whey agglutination test, although regularly positive in the goats suffering from a specific mastitis, rarely parallels the serum reactions. It is subject to great fluctuations and is frequently negative in those with an abundance of serum agglutinins.* Finally, it is known that in non-infected territories, occasional agglutination reactions in dilutions of 1:80 to 1:160 have been recorded. The milk of such “reactors” or the carcasses have been examined bacteriologically. No Brucella organisms have been found.

(2) Blood cultures: Since the caprine Brucella infections are accompanied by a bacteriemia, which may persist for 59 days or even longer, it may be advisable to examine the serum reactors with the aid of blood cultures. Animals with high agglutination titres and sterile milk secretions may yield positive cultures. This method is merely of interest in the study of individual infections and has no practical value in an eradication program.

(3) Allergic skin tests: The extensive studies by Dubois and Sollier for a period of four years and a limited number of personal observations have shown that the allergic skin reactions are specific and of definite diagnostic value. As reagents, either a potent “abortin” or “melitin” or a heated suspension of Br. melitensis in salt solution (two billion organisms per cc, heated for one hour at 70°C and held on ice) may be employed. The injections are made in the folds of the tail. Even ophthalmo-

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reactions may be useful. The local reaction, reaching its maximum intensity between the 36th to the 72nd hour, is characterized by a pronounced edema, hyperemia and may be accompanied by a general febrile reaction (ninth to 20th hour).

Goats with negative histories or those secured from non-infected territories invariably failed to react to the skin tests. However, it is doubtless of interest that in a series of animals infected experimentally with Brucella organisms many months preceding the allergic tests, as a rule, the more intense reactions have been observed in those which are serologically classed as non-infected and have subsequently been found to yield bacteriologically sterile tissues. To detect goats with latent infection, it appears that the skin tests are more dependable than the serologic tests. But since a state of allergy may persist even after the organism has freed itself of the Brucellas, it must be anticipated that animals in all probability immune may, with the aid of this test, be classed as infected. This apparent disadvantage should in no way invalidate the prime usefulness of the allergic tests in any eradication program of caprine brucellosis. Any herd or flock, which contains goats allergic to suspensions of Brucella organisms, is infected and the reactors should be removed whether they are immune or carriers.

The preliminary investigations have progressed far enough to warrant the combined application of the allergic serologic tests. Public health authorities should demand that goat milk dairies consist of animals which give negative skin, blood and whey tests. Finally, the time has arrived when efforts should be made to prevent the interstate shipment of goats reacting to the skin tests. Until the procedures have been tested on a large scale under the conditions prevailing in the Southwest, it is obviously premature to state whether or not it is practical to control and finally eradicate Malta fever in the mohair goat herds in the states proven to be infected.

(4) Vaccination: Contrary to the views of Ascoli and Sanfilippo and Vincent, neither heat-, ether- or formol-killed vaccines, extracted bacillary bodies given intradermally or subcutaneously several weeks before impregnation, protect goats and sheep against a subsequent infection by mouth or by contact (Burnet, Dubois and Sollier and personal observations). A certain measure of protection against a natural exposure in a normally very susceptible animal may be conferred by the intradermal vaccination with "antivirus" broth filtrates containing avirulent Br. abortus organisms (Zammit and DeBono). Indeed this type of vaccination may result in a marked suppression of
abortions, sterility and loss of kids (Dubois\textsuperscript{34}). These encouraging reports have thus far not been confirmed nor have the results of the preventive vaccination been checked by a systematic examination of the tissues at autopsy. It is well to remember that the experiments have been conducted on goats which were raised in the endemic area of the island of Malta or southern France. Various reports indicate that the animals of these regions possess a great inherent immunity. A few immunization experiments conducted on goats raised in California are herewith cited in order to point out that preventive vaccination is indeed in an experimental stage.

\textbf{Goat 466}: Fed \textit{Brucella} type \textit{suis} (Hulbert); reacted serologically (1:320) and allergically (3+); within 139 days recovered (agglutination 1:20); bred 225 days later; injected with \textit{Br. melitensis} (caprine No. 2) subcutaneously; negative blood cultures; aborted on 30th day after injection (three-month fetuses); on 50th day after injection of melitensis agglutination titre 1:20,000; \textit{Br. melitensis} in supramammary and iliac lymph-nodes.

\textbf{Goat 486}: Fed \textit{Brucella} type \textit{suis} (human, Borland); reacted serologically 76th day (1:840) and allergically (4+); recovered in 225 days (1:80); bred; injected on 225th day with \textit{Br. melitensis} (caprine) subcutaneously; sterile blood cultures; autopsy on 57th day after injection; melitensis in left supramammary and left inguinal lymph-nodes; right uterine horn.

\textbf{Goat 135}: Injected living avirulent \textit{Br. abortus}; no reaction; injected with \textit{Br. melitensis} (caprine); positive blood cultures 7th, 15th and 26th days; aborted 27th day (one fetus 2½ months old); at autopsy on 63rd day, \textit{Br. melitensis} in both kidneys, spleen, udder and right and left prescapular lymph-nodes.

\textbf{Goat 1085}: Injected intravenously living avirulent \textit{Br. abortus} (H) no reaction; phagocytic low; 70 days later, injected subcutaneously \textit{Br. melitensis} (1085) human origin caprine passage. Positive blood cultures on 14th and 41st days; allergic tests (4+); positive culture from the right prescapular lymph-node at autopsy on the 166th day after injection with \textit{Br. melitensis}.

The experiments briefly show that a previous infection with a suis type or an avirulent bovis type abortus bacillus, conveyed by ingestion or by injection, has at least in two instances failed to protect the goat from abortion or specific endometritis, metastatic localization in the lymph-nodes when the animals were reinfected with an American melitensis strain. Perhaps the only difference between the supposedly protected goats and the controls was the constancy with which the melitensis organisms were absent from the blood cultures in the previously treated animals. By contrast the immune goats invariably gave negative blood cultures but the genital localization and latency of the melitensis organism differed in no way from those seen in the nontreated goats. In the animals injected with avirulent \textit{Br. abortus}, even the blood cultures remained positive.
Although the outlook for a dependable method of preventive vaccination is not very hopeful, the various possibilities have been by no means exhausted. At least, for the present, no recommendations can be made.

**HUMAN INFECTIONS**

Mostly goat-herders have been involved in the two herds examined in 1930. Their infections followed the kidding time. It is, therefore, reasonable to suspect contact with heavily infected afterbirths.

The histories of three cases, which were contracted as a result of the ingestion of raw goats' milk, are illustrated in table II.

**TABLE II—Goat milk dairy at T.** (P. Owner agglutinates Br. melitensis, March, 1933, 1:320. P. His wife agglutinates Br. melitensis, March, 1933, 1:20. Neither showed any clinical signs but both drank infected milk and had intimate contact with goats.)

<table>
<thead>
<tr>
<th>Source of Milk</th>
<th>Consumed by</th>
</tr>
</thead>
</table>
| Goat “Bally,” 4 years reactor, aborted; typical chronic infection; shedder in milk | Mr. Cl., 6 weeks, every other day; Malta fever  
Mrs. Cl., 6 weeks, every other day; Malta fever  
Boy G., 75 days; well  
Mr. Cl., 3 months; well  
Mr. W., contact milk; Malta fever |
| Goat “Snowball,” 3 years reactor; dead full-term kids; shedder | Mr. W., contact milk; Malta fever (also milk of “Bally”) |
| Goat “Sandy,” reactor; not shedding | 2-year-old child, 1 month; well  
Mrs. C., 2 months; well |
| Goat “Spreckels” negative | 6-month-old baby, 1 month; well  
Mrs. C., 2 months; well (also milk of “Sandy”) |
| All four goats | Mr. G., 2 months; well |

*Note: “Sandy” and “Spreckels” frequently milked in same pail as “Bally” and “Spreckels.”*

The owner of the dairy and his wife remained clinically unaffected, although they ingested the heavily infected milk, and handled contaminated afterbirths. The man must have passed through a latent infection, as judged by the positive serum reaction. Of the two, man and wife, who contracted undulant fever, the wife was ill for about four months and made an uneventful recovery. The husband, on the other hand, was sick for nearly a year. He discharged typical melitensis bacilli in his urine. The third patient also was ill for over a year: A
nine-year-old boy and two middle-aged men, who consumed the infected milk, remained well. It has not been practical to test their blood or determine their immunity by allergic tests. These observations support the well-known epidemiologic fact that the susceptibility to Br. melitensis, although much higher than for Bang's disease, is never 100 per cent and, in all probability, no more than 20 per cent for the clinical, and 50 to 75 per cent for the abortive, or latent, infections. Furthermore, it is apparent that the susceptibility of the host plays a much greater rôle than the virulence of the Brucella organism in the clinical appearance of the disease.

BIBLIOGRAPHY


BANG'S DISEASE CONTROL PROJECT

By V. S. LARSON, Madison, Wis.

State Department of Agriculture and Markets

Some years ago, the Division of Live Stock Sanitation of the Wisconsin Department of Agriculture and Markets was confronted with the problem of how best to handle Bang's disease in cattle with a view of eventually eliminating it entirely from our herds with the least possible financial loss to cattle-owners and with as little public expense as possible.

Previous to this, there had been much misinformation disseminated regarding this disease and its control by parties desiring to sell some so-called cure which possessed no value what-
ever except to extract a sum of money from the uninformed cattle-owners.

Our first task, therefore, was to correct this misunderstanding and give farmers the correct information regarding the disease and its control. This task presented many difficult problems due to the fact that a large number of cattle-owners had spent vast sums of money on promise that their herds would be cured, only to find later that they had been swindled and that the disease still existed in their cattle. Following such experiences, it was only natural for them to regard any Bang disease control program with a considerable amount of suspicion.

In order to obtain the confidence of cattle-owners in this Bang's disease control program, it was necessary to do a considerable amount of educational work. This was accomplished partly through farmers' meetings that were arranged by county agricultural extension agents whose affiliation with the project contributed much toward gaining the confidence of cattle-owners. We soon found, however, that merely telling cattle-owners how to control Bang's disease was not sufficient and that it would be necessary to supplement our educational meetings with actual control work in infected herds to demonstrate the value of this control plan.

After conducting a series of educational meetings in a county, the county agricultural agent, with the assistance of the practicing veterinarians of the county, would select from five to eight infected herds well distributed over the county to be used as demonstration herds. These herds were blood-tested at intervals of from 30 to 90 days and following the initial test a plan of sanitation would be recommended for the herd-owner to follow, that would be based on the amount of infection disclosed, conditions under which the herd was kept and the owner's ability to adjust himself to new means of handling his herd.

Each visit to the farm was well advertised and all interested in the work were invited to be present in order that they might become familiar with the project and learn from personal observations just what was being accomplished in controlling Bang's disease and incidentally receive first-hand information relative to the responsibilities placed upon the herd-owner as well as comparing the relative value of the different plans of sanitation recommended.

The plans of sanitation were designated as A, B and C. Following is a brief outline of the Plans.
Plan A: All positive cattle are removed to a separate farm or disposed of and the premises thoroughly cleaned and disinfected. The retests were made in from 30 to 90 days depending upon the amount of infection disclosed and whether we were dealing with a dormant or an active infection.

Plan A will give excellent results if all instructions pertaining to disinfection of premises, additions to herds, and other matters of sanitation pertaining to the handling of the herd, such as contact with neighboring infected herds over line fences and the use of herd sires in herds other than their own, etc., are followed. It has been our observation that plan A, when properly followed, will give better results than can be obtained with any other plan in the elimination of any contagious live stock disease with which we have had any experience.

Plan B: Reacting cattle are not disposed of except those that are unprofitable but are kept in semi-isolation and not permitted to contact negative cattle in barns, yards or pasture. They are segregated in one portion of the stable but are removed to a separate building during parturition and for a period of about three weeks following calving, during the most infectious period, after which they are returned to the positive group again. Where only one herd sire is used in the herd, positive cattle are not bred until they have been fresh from 60 to 90 days. Calves of both negative and positive cattle are raised but are removed from all possible contact with infection before they attain the age of sexual maturity and are fed milk of negative cattle or pasteurized milk. The premises are disinfected at regular intervals and other sanitation measures are followed in detail to prevent the spread of infection.

This plan, when properly followed, has given excellent results and is recommended where there are valuable cattle reacting that the owner desires to maintain for the purpose of reestablishing his herd along certain blood lines. We have found, however, that unless all matters of sanitation are strictly observed, the results obtained will be most unsatisfactory.

In one instance in a herd of 34 head of cattle with 14 positive cattle, we recommended plan B. For a time the herdsman followed our recommendations very carefully and there was no spread of infection. Then he became careless, did not isolate reacting cows at calving time and did not disinfect the premises properly. We then had a gradual spread of infection until we insisted that the owner adopt plan A and remove all reactors and disinfect properly. We retested that herd at 60-day intervals.
for a year without a new reactor developing and the herd is now certified.

In another herd consisting of 56 head of cattle, we found 39 head reacting and 17 negative. We recommended plan B for the purpose of conserving certain blood lines. In this instance the herdsman followed all of our instructions in detail. This herd was retested at intervals of about 60 days for a period of three years without a new reactor developing. The positive cattle were gradually disposed of, as they became unprofitable due to sterility, or other disorders common to Bang's disease, and were replaced with heifers raised in the herd or in a few instances replacements were purchased from negative herds. The herd is now entirely negative with 62 head of cattle and heifers. The records of these two herds is a fair example of results we have obtained in nearly all of our demonstration herds.

Plan C: This plan does not differ from plan B except positive and negative cattle are yarded and pastured together. This plan is never recommended except as a temporary measure to give some assistance until arrangements can be made to adopt a better plan. The cattle-owner is never given encouragement regarding results to be expected with plan C, though at times the results have far exceeded our expectations.

During the past five or six years, we have conducted demonstrations in 70 herds containing 3,669 head of cattle with a total of 1,013 head reacting. This includes all cattle reacting incomplete in dilutions of 1:50 or more. The reacting cattle have not been retested at regular intervals but were retested sufficiently often to determine their status and out of 1,013 reactors, all positive reacting cattle have continued to react over a period of from one to five years with the exception of 66 head that have never given a complete reaction. Twenty of these later returned positive to the same degree they originally reacted or stronger. There still remain 46 head that have not returned positive but none of these have ever reacted stronger than an incomplete in a 1:50 dilution. A number of these have been disposed of, due to various disorders which rendered them unprofitable for dairying or breeding purposes and no further testing records will be available. Also, we have found that of the 1,013 reactors in not a single instance did a cow cease to react or react to a lesser degree as a result of advanced pregnancy or recent parturition.

In our demonstration work we have found a number of bulls that have reacted to the test in varying degrees up to complete
in dilutions of 1:800. There has long been a question relative to the possibility of reacting bulls transmitting the infection to negative cows bred to them. In our work we have definite information that, in some instances at least, this does occur and the evidence also indicates that the degree of reaction correlates somewhat with the extent to which the bull may be a danger in transmitting the infection.

In one instance a bull reacting incomplete in dilutions of 1:50 was bred to a herd of about 40 cows, some of which were positive, months and to about 40 negative cows over a period of one year without a reaction developing.

In another instance a bull reacting in all dilutions up to 1:500 was bred to a herd of about 40 cows, some of which were positive, but all negative cows bred to this bull would react within 60 to 90 days from date of service. In another instance a bull reacting complete in 1:50 and incomplete in 1:100 and 1:200 and negative in 1:400 bred three negative cows and in 60 days two of the cows were positive in dilutions of 1:50 and incomplete in 1:100 and 1:200. The third cow never reacted.

This evidence, while rather limited, would indicate that a reaction in a bull would render him unsafe for service on negative cattle. We have also found that many positive reacting bulls become sterile or at least uncertain breeders within a few months, though a few of them continue to breed as well as negative bulls.

Of the 70 demonstration herds, 20 adopted plan A, nine adopted plan B and 41 plan C. Of the 20 herds in which plan A was adopted, 18 are entirely negative. Of the nine in which plan B was adopted, eight are negative and of those working under plan C, 15 are negative. The two herds under plan A, that are not negative, were at one time negative but were reinfected through disregarding our regulations in the matter of making additions. All of those owners adopting plan B have now changed to plan A and disposed of their reactors. In the 26 herds under plan C that are not negative, we have had some spread of infection, though a great deal has been accomplished in limiting the progress of the disease until the owners can arrange to adopt a more efficient plan of sanitation.

In this demonstration work in Wisconsin, the practicing veterinarians have contributed much of value to the project. Before they are permitted to do official Bang's disease control work, however, they are required to become thoroughly familiar with all
phases of it. The part they have taken in the demonstration work has afforded them an excellent opportunity to do this and to develop a splendid technique in taking blood samples, interpreting the test and outlining the necessary sanitation measures. Our Disease Control Laboratory has been of inestimable value in developing this part of the program. The veterinarians are required to submit blood samples together with their records of test results for check-testing and any variation in test results must be corrected. This check-testing is continued until there is less than 1 per cent variation between results obtained by veterinarians and laboratory.

In the early stages of the Bang's disease control program in our state and at the time the demonstration herd project was in the process of development, we were dependent upon Brucella antigens which were produced by various commercial concerns. A marked variation existed, both in the quality and in the sensitivity of the various antigens which were produced by the different concerns. There likewise was a marked variation in the different lots of antigen produced by the same concern. It was obvious that the program had no chance whatever of success unless a standardized antigen conforming to a constant standard of sensitivity was available for use at all times. The situation as it existed, in which such antigens were used, gave widely variable results, which not only failed in the attainment of desired results from the standpoint of Bang's disease control, but also resulted in discrediting the program. One veterinarian would use a certain antigen and obtain a very distinct reaction to the test, but when this same animal was tested by another veterinarian, using a different antigen, it would be completely negative. Such incidents created widespread discussion, which seriously questioned the efficiency of the test and the results obtained.

The situation had to be corrected and there were only two alternatives to choose from. One was, that the commercial companies get together and agree on producing a uniform product with a uniform sensitivity, and the other, that, if the first stated proposition could not be materialized, it would be necessary for the state to manufacture its own antigen.

Suggestions were made to commercial concerns that something be done in the way of organization, so that an agreement might be reached upon a proper standard of sensitivity and quality for rapid Brucella antigen. These suggestions were not heeded, and the individualism of some of the concerns was asserted even to the extent to criticizing our state agency for making an effort to arrive at the necessary and desired standard. In view of this
lack of interest among those engaged in furnishing antigen to our state, it was necessary for us to make proper arrangements for the manufacture of our own antigen. The State, which is already engaged in the manufacture of tuberculin, legume cultures, and other biologics, did not find it a very great problem to adapt a great deal of the equipment already in use to the manufacture of antigen. After the State was in a position to manufacture all of the antigen necessary for use in our state, requirements were made of biologic concerns selling antigen in Wisconsin, to submit in advance samples of each lot of antigen manufactured to our state laboratory for inspection prior to selling the antigen for official use in this state. This procedure is now in effect, and commercial concerns are privileged to sell approved lots of antigen for official work within this state.

It was very apparent that, when we were in a position to use uniform and standardized antigen, the results in the field showed marked improvement. Complaints pertaining to unusual variations in the tests by different veterinarians have entirely disappeared; in fact, during the past year not a single complaint has come to this office. The success with eliminating the disease from individual herds when the standardized antigen was used was noticeable and outstanding.

I wish to make it clear, that it was not the desire of the State to engage in the manufacture of antigen, as there was the disposition to leave the making of antigen to those who are engaged in this line of work commercially. However, the situation was such, that if the program was to proceed with success, it became a necessity on the part of the state to manufacture antigen for the Bang’s disease control work.

A few months ago, when the U. S. Department of Agriculture offered us the present plan for the elimination of Bang’s disease, we found the preliminary work done in our state of great value in organizing and promoting this work. We found that as a result of the educational work on Bang’s disease and its control, cattle-owners were not only favorable to the project but were very eager to take advantage of it and establish herds free from this disease. Also, the knowledge they had gained, regarding the nature of the disease and the measures necessary for its control, has eliminated much of the misunderstanding, dissatisfaction and opposition that ordinarily results from such control measures.

One of the principal points of concern of cattle-owners has been the probability of reinfecting negative herds where a neigh-
boring herd is infected and where no control measures are adopted. In the early stages of this work this did appear to be a perplexing problem but as the project developed, we found that while this may serve as a potential source of danger to a clean herd, if ordinary practical precautions are observed, there will be but little reinfection from this source. We found this to be true in our demonstration work, and in reviewing the records of 620 accredited or certified herds in Wisconsin, we find that only 12, or less than 2 per cent of these herds, have been removed from this list over a period of one year as a result of reinfection even though practically all of these herds have been maintained in close proximity to infected cattle and in many instances entirely surrounded by such herds. This is a better record than we have been able to establish for any other prevalent contagious live stock disease control plan.

As soon as the project was announced, cattle-owners from every section of the state flooded our office with requests for immediate service and, generally speaking, we were in a position to grant these requests as a result of having about 300 veterinarians, well distributed over the state, who were thoroughly trained in all phases of this work.

Meetings of cattle-owners have been arranged for us by county agricultural agents in nearly all sections of the state, where we have had an opportunity to explain the contract that must be signed before they can secure this service, and give any additional information for which they may ask. At the present time there are about 25,000 herd-owners who have signed contracts asking for this test. This represents over 500,000 head of cattle. The applications are continuing to come to our office. During the past week we received about 2,000 new contracts which is an increase over previous weeks.

Up to the present time, approximately 15,000 herds have been tested, containing about 300,000 head of cattle, 15 per cent of which have reacted.

In some counties, nearly 100 per cent of the cattle-owners have made application for this service and, judging from present indications, a vast majority of Wisconsin cattle-owners will avail themselves of this financial aid in eradicating Bang's disease from their herds in the event sufficient funds are made available.

PRESIDENT ROBINSON: The next item is the report of the Committee on Bang's Disease, by Dr. C. P. Fitch.

... Dr. Fitch read the report... (Applause.)
REPORT OF COMMITTEE ON BANG'S DISEASE

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

Dr. W. E. Cotton, Bethesda, Md.  Dr. W. Wisnicky, Madison, Wis.
Dr. G. H. Hart, Davis, Calif.  Dr. R. R. Birch, Ithaca, N. Y.
Dr. M. F. Barnes, Harrisburg, Pa.  Dr. J. M. Buck, Bethesda, Md.
Dr. C. M. Haring, Berkeley, Calif.  Dr. F. M. Hayes, Davis, Calif.

Your Committee this year has had one meeting, at the time of the American Veterinary Medical Association meeting in New York City, when the program for this session was mapped out and the general plan of this report outlined.

The past year has been an eventful one in the history of the control of Bang's disease. A federal program in cooperation with the states for combating the malady by blood-testing on a voluntary basis and the slaughter of reactors has been started. The legislature of Virginia passed a law appropriating money for the payment of indemnity for animals infected with Bang's disease. The wisdom of paying indemnity for animals infected with this disease has not been extensively discussed by this organization. There is a demand on the part of stock-owners for such indemnity. Cattle-owners especially have been influenced by the indemnities paid in connection with tuberculosis. Your Committee believes that indemnity questions should receive full and open discussion at this time.

Two years ago, this Association, on the recommendation of your Committee on Bang's Disease, adopted a uniform technic for the test-tube agglutination test. We believe that this has been quite valuable, since it has enabled laboratories engaging in Bang's disease control to have a standard method of diagnosis.

We have noticed the increased use which the so-called rapid or plate agglutination test for Bang's disease has had in various localities, especially in Wisconsin.

Although the test is called the rapid or plate agglutination test, it should be borne in mind that the term "rapid" applies to the time in which results may be obtained. It does not apply to the amount of time that must be consumed by technicians in carrying out the test. Studies made in the laboratories at the University of Minnesota indicate that there is very little actual time saved in carrying out this test over that used in the tube test. It does, of course, make the results available earlier than does the test-tube method, and furthermore, it can be carried out by the trained practicing veterinarian with less equipment than is required for the tube test.

It is highly important that the antigen used in the plate agglutination test for Bang's disease be properly prepared and properly standardized. Satisfactory results cannot be expected from this test when an improper antigen is employed. When this test is used, it is highly essential that it be carefully supervised and the results checked from time to time. It may further be borne in mind that not all bovine sera give identical results with the test-tube and plate methods.

The present campaign to eliminate Bang's disease under the AAA was hurriedly entered into and upon a very extensive scale. Your Committee realizes that some mistakes will be made in drawing and handling such large numbers of blood samples, in the manipulations involved in making the tests, in preparing the antigen and in reading, recording and reporting results. Some mistaken results may justly be ascribed to the limitations of the test itself.

Your Committee believes, however, that the undertaking will reduce temporarily the cattle output and aid many owners in controlling and eradicating the disease from their herds. Your Committee strongly endorses the program.
Despite the widespread incidence of the disease, not all herds by any means are infected. Encouraging progress has already been made in reducing the disease in some sections, and the effect of this campaign on the rank and file of cattle-owners will be of great educational value in disseminating knowledge of the disease and methods of preventing it. The taking of infected cows from production will be accompanied by increased public confidence in the use of dairy products.

Veterinary regulatory officials in particular and members of the veterinary profession in general should recognize the great responsibility placed on them in this work by the public at large. Every effort must be made to reduce to a minimum the errors arising from extensive testing and interpreting results to the end that the greatest possible reduction in the incidence of the disease and the maximum amount of benefit from the public money expended be insured.

Mention should be made of the fact that a similar national plan to reduce Bang's disease is in progress in Norway. A report of this was made by Dr. H. Holth, of Oslo, at the International Veterinary Congress held in New York City in August of this year.

Thirty-three states now require negative agglutination blood tests in order that cattle may enter their confines. In addition, eight states will not allow a positive reacting animal to enter except under special permit. Seven states have no requirements relating to Bang's disease. Some large purchasers of cattle require not only a negative test for the individuals secured but also negative herd tests; and not one negative herd test but three. In other words, the same thing has come about in connection with Bang's disease that prevailed in respect to tuberculosis. Buyers first had a test of the individual. Next came the accredited herd, then the accredited county, and finally the accredited state itself. We must bear in mind that these latter advances, especially since 1917, have been done under a uniform plan adopted by this Association and under uniform interstate shipping regulations. We believe that it is highly desirable for the sanitary control officials of the various states to cooperate fully to the end that regulations of the various commonwealths be as nearly uniform as possible. We desire particularly to urge upon the various commonwealths, and especially the organizations within these states which have to do with the control of animal diseases, to be fully aware of the dangers of ill advised and too stringent regulations in respect to Bang's disease.

PRESIDENT ROBINSON: The next is a symposium on "Federal Cattle Reduction and Disease Control Program on the Basis of the Elimination of Bang's Disease Infected Animals." There are five speakers, and the program says: "It is understood that the above group simply start the discussion which will be thrown open for all those who wish to take part." I will call on these gentlemen as they appear on the program. The first is Dr. A. E. Wight, of the Bureau of Animal Industry, Washington, D. C. (Applause.)

Symposium on Bang's Disease

DR. WIGHT: Mr. Chairman and Gentlemen: It is very gratifying to have such an audience on this occasion, and I hope we will be able to have time enough to hear from all sections of the country on this subject. I have reduced to writing the few remarks that I wish to make at this time.

Funds provided by the 73rd Congress in supporting the LaFollette Amendment to the Jones-Connally Bill for the relief of the cattle industry, including the reduction in the cattle population, made it possible for the federal government to start the Bang's disease work in cooperation with the state authorities. Owing to the emergency created by the extreme drouth conditions in several states, during the
early summer this year, there was necessarily some delay in beginning the Bang's disease work, but it was possible to begin operations July 19, 1934.

The operation of this project was delegated to the United States Bureau of Animal Industry, and the Chief of the Bureau was in a position to start the cooperative work in a comparatively short time, having previously determined through correspondence the ability of the state officials to cooperate and examine blood samples taken from herds that were to be tested for Bang's disease.

Many of the state livestock sanitary officials were already directing a Bang's disease program, which made it possible to place the cooperative work on an active basis quite promptly. This work naturally entailed a vast amount of labor in organization, preparation, etc., including regulations, agreements, instructions, and a multitude of details, which required attention.

RESULTS

A report of the work conducted cooperatively in the various states in Bang's disease has been prepared, as of November 1, 1934. This includes the testing, and results of the examination of the blood samples from reports received by the Bureau up to November 1. A summary of this report has been prepared, and is available at this meeting.

This summary indicates that the agglutination blood-tests were completed on approximately 232,000 cattle, contained in 12,000 herds, and that about 33,000 animals gave positive reactions to the test. It further shows that almost 50 per cent of the herds that were tested, showed some infection. The total number of herds under supervision, on November 1, was about 12,600, containing 236,000 cattle. In explanation, it may be stated that in some of the states, many of the herds were under state supervision prior to the beginning of the cooperative project.

As an indication of the demand from the cattle-owners for service in connection with Bang's disease work, a portion of the report, under the heading "Waiting List," shows nearly 900,000 cattle in herds where owners have applied for the test.

On November 1, a compilation of the data concerning indemnity claims for Bang's disease indicates that the average appraisal was about $53.00, the salvage $14.00, and the indemnity payment $25.00. Nineteen per cent of all the cattle contained in the claims recorded up to that time were purebred. Under the provisions of the federal regulations, the maximum payment for grade cattle is $20.00, and $50.00 for pure-bred registered cattle. The owner receives the net salvage, in addition to indemnity, but in no case does the owner receive more than the appraised value.

The only states in which the owner receives state indemnity, at the present time, are Virginia and Maine.

Preliminary reports on the Bang's disease work done in the month of November indicate that the number of cattle tested will be very much greater than the number reported for the first four months of this cooperative work.

At this meeting today, it is hoped that the representatives from each state present will be able to inform us regarding the progress of this work in his state.

Without consuming any more of your time, I wish to thank you for your kind attention, and I shall be glad to explain further any features of the federal project as far as possible, if requested.
VIRGINIA

PRESIDENT ROBINSON: The next speaker is Dr. H. C. Givens, State Veterinarian, Richmond, Virginia. (Applause.)

DR. GIVENS: Mr. Chairman and Gentlemen: I did not write my speech because I did not know what I was going to say at this stage of the program. However, I am glad to say that everything that has happened thus far suits me very well. I am gratified at the sentiment that seems to prevail here at this time.

We started the Bang's disease work in Virginia about 1930, in a somewhat more scattered manner than has been done in other states, to see what we could do to suppress the disease. That resulted in the establishment of about 360 herds of cattle free from Bang's disease. Some of these herds were infected, and some were clean originally. It also served to mold public sentiment in favor of suppressing the disease in the state, which led to the passage, by the Virginia legislature last winter, of the indemnity law. I would say in passing that this law was passed by the state legislature without opposition from anyone. The sentiment was 100 per cent in favor of it.

There may be some demand for explanation of this Virginia law that has been mentioned here several times. I will not go into the details of it at this time, but if it is wanted I will take it up later.

The law carried a small appropriation. Our cattle population of Virginia is small, amounting to something like 400,000 cows. The appropriation was $30,000; $15,000 per annum.

The AAA program is fitting the conditions admirably in Virginia, in view of the fact that we are taking advantage of the AAA money for the first test and the first retest on herds of cattle. We have withheld state indemnity.

We are beginning to test some herds for the third time, or the second retest, on which we are paying state indemnity. We propose to continue to pay the state indemnity as long as it lasts and as long as the herds need to be tested to free them from the disease.

Another thing that is being done in the state and that I believe will be of interest at this time is that we are refusing to spot test cattle for interstate shipment. To explain that, if a man sells a cow out of his herd for interstate shipment, we will not test that cow for interstate shipment unless he tests his entire herd and removes all his reactors under the AAA contract.

I think the time has arrived when a permanent program for the control of Bang's disease is in order in this country. I think the cattle-breeding industry of the country is putting it squarely up to us to take hold of this problem and go ahead with it. I know that the Virginia people expect future action, and I venture the statement that they will continue to make further appropriations of money, as may be necessary and within reason, to continue the program of Bang's disease control or eradication, whichever way you choose to term it.

I hope that out of this meeting will come a definite program, a uniform program for the whole country. There are many problems that confront us in getting at this thing in a sensible manner and working it out in the most economical manner possible. (Applause.)

PRESIDENT ROBINSON: The next speaker is Dr. Walter Wisnicky, Director of Life Stock Sanitation, Madison, Wisconsin. (Applause.)

WISCONSIN

DR. WISNICKY: Mr. President and Members: Since we met last year, considerable has been accomplished in the way of a beginning in disease control. We find ourselves with a new army, so to speak, attacking on an extensive basis, another animal plague, namely, Bang's
disease. That did not all happen since last year, because the interest in Bang's disease control perhaps antedates the birth of the oldest of us in this audience.

In speaking to our farmers and to those who have been in live stock sanitary work during the past 20 years, we find that there has been a demand on the part of the live stock owners for substantial assistance in Bang's disease control.

I was talking the other day to Dr. Healy, our federal inspector-in-charge in Wisconsin, and he told me that when he came to our state approximately 16 years ago, the question he was asked most by farmers was, "When are you going to help us with contagious abortion?" Our state was not so heavily infected with tuberculosis; therefore, the farmers did not experience large economic losses from that disease, but they did experience, even 15 and 20 years ago, large economic losses from Bang's disease.

That request on the part of farmers continued throughout the years. In talking to the veterinary inspectors who have visited every one of our 180,000 farms at three-year intervals, they tell us they are asked by the majority of farmers, "When is the government going to help us control and eradicate Bang's disease as it has helped us in our tuberculosis problem?"

As time went on, this so-called latent and feebly expressed demand materialized into a more insistent and louder demand. Within the past few years the pressure on the live stock sanitary employees in our state has been very insistent and very emphatic that we do something in the way of Bang's disease control.

You know, live stock sanitary officials are, to a large extent, traffic policemen, but they have to be more than that. When the farmer has losses from an animal disease, he comes to you and says, "I am having these losses. It is up to you to find some way of giving me assistance." With a disease problem as large as the Bang's disease problem, that assistance must be given in an organized way and can be given only when sufficient funds are available to carry on an extensive program. So it devolved upon us in Wisconsin, as well as on the live stock sanitary authorities in other states, to take active steps to secure legislation and to secure funds for use in the control of this disease.

Some time last spring, I was one of the group that attended a conference with Senator Bob LaFollette that started the ball rolling for legislation to assist us in controlling this disease. I think we are rather fortunate that the circumstances were such that we could secure funds to start this work at this particular time. I believe that the economic conditions as they exist were, in part at least, a circumstance that enabled us to get favorable action on our request for legislation and for funds to start our work in connection with Bang's disease.

When a program like this is started, it takes thorough organization in order that we may get anywhere. About 1928, we started in Wisconsin to give very definite attention to Bang's disease. We set up a program which was of a voluntary nature. The program provided that the owner had to stand all of the costs in connection with the expenses involved in working with this disease. I think about 6,000 herds received a test before the federal program started. Many of these herds were negative, but the farmer, due to economic conditions in recent years, thought, "Well, I have a negative herd. I think I know pretty well how to protect myself. I just can't afford to pay for a retest." So he went on that basis and did not carry the herd to the status where it might be recognized as an accredited or certified herd.
This early work prepared us for the program in which we are now engaged. At the present time, as has already, in part, been indicated to you, we have approximately 150 men engaged in Bang's disease control work. We are testing somewhere in the vicinity of 9,000 cattle a day and we are sending about 1,000 cattle for slaughter each day. We have approximately half a million cattle signed up under the program, and about half of those cattle have already been tested.

We are confronted with one difficulty at the present time and that is that we cannot go fast enough with the livestock owners, who are signed up under this program, to give them the service that they think they need right at this particular time. I don't know just why they are in such a hurry. I think the feed problem has some connection with it, but I think there is also a fear that there won't be enough funds to go around and they want to get in while funds are still available. There must be something like that, or there would not be that insistent demand.

In talking to Dr. Healy the other day, he said that half of the phone calls he receives are requests for an early test. I know that is my experience. I find little time for anything else except explaining why we cannot come and test the herds as soon as they want us to come.

We are employing every available veterinarian who is qualified and trained on this program at present. We perhaps could use additional men but, under the circumstances, I think we can go along fairly well as we are.

I think I see a problem in the offing that must be given definite recognition. As the private practice of the practitioner increases, with better conditions, then we will have less opportunity to utilize him on this Bang's disease control work. We have noticed that there is a very distinct lack of interest on the part of the practitioner in connection with this program, and that lack of interest is a result of the low remuneration which the veterinarian gets. I think that has been discussed by organized veterinary groups in our state with the thought that some means may be brought about to improve the condition.

From my discussions and what I hear at various meetings, I know that the federal Bureau of Animal Industry has done everything possible to try to bring about better conditions in the way of remuneration for the veterinarians who are employed in this program. Perhaps the situation will have to go along as it is for the present, but I think, as we look to the future, if this work is to continue, some arrangement will have to be made so that the men who are employed in technical work must be given consideration, so that the remuneration which they are receiving will be commensurate with the service which they are rendering.

Up to this time we have not had an opportunity to make any retest, that is the first retest. We made the initial test on approximately 12,000 herds, and retests are due on a considerable number, but the demand for the initial test is so great that we have had no opportunity to make the second test. I think we are losing something there, but we just cannot help ourselves. We are using every available man, and we have to give attention to the initial test before we can consider giving the first retest.

I think the thing that perhaps concerns us most at the present time, in connection with this program, is what will happen after the present funds are exhausted. Considerable work is being done in a number of states on this Bang's disease control program, and it is inconceivable to think that we can stop, after this initial effort is terminated. I don't think the livestock producers will let us stop. I think they will direct us to find some ways or means to find funds to carry on this work to a successful conclusion.
I recall a situation that occurred in Madison last April, when the AAA held a meeting to which farmers were invited, and only farmers qualified to get up and discuss their problems. Anyone who was not a farmer or herd-owner was not qualified to take the platform to talk for the industry. The object of the meeting was to secure the sentiment of the farmers as to what they wanted in the way of relief or in the way of reducing their cattle population, which would serve as a relief measure.

They took a written vote at that meeting, and the Bang's disease control program received twice as many votes as any other program that was offered. That expresses, in a general way, or in an accurate way, the sentiment of the live stock producers in our state. From my observation of the interest in this Bang's disease problem, I know that we must continue after this initial effort is completed.

I want to bring up this last point for further discussion by this group. I think we ought to be able to formulate, at least in a tentative way, some general suggestions as to how we are going to continue this work after the initial appropriation is exhausted. (Applause.)

President Robinson: The next speaker on this subject is Dr. C. C. Hisel, State Veterinarian, Oklahoma City, Oklahoma. (Applause.)

Oklahoma

Dr. Hisel: Mr. President and Friends: The first thing I want to say is that I think Doctor Wisnicky has had more money than is due him now, and I am going to offer a resolution, if necessary, to stop him until I catch up. (Laughter.)

Down in Oklahoma, to start with, there was a general lack of interest with reference to the control of this disease, I think largely due to the fact that they did not understand what it was all about. In fact, when we started to talk about Bang's disease, the average farmer did not understand anything about a disease known as Bang's disease, but when he did find out that Bang's disease and contagious or infectious abortion were one and the same disease, business picked up immediately.

We have under supervision 2,892 herds, totalling 68,300 cattle, from which, up to date, we have taken 3,466 reactors, which in itself proves that Bang's disease is an important economic question to the cattle industry of the country. It has been stated by several authorities that this disease has been costing the cattle industry of the nation upwards of $50,000,000 annually, and any disease that costs that much money certainly is entitled to the consideration of this organization, the American Veterinary Medical Association, the Congress of the United States, and the various legislatures.

In our state there is a keen interest in the control of this disease at this time, so much so that down in Grady County, at Chickasha, 300-odd farmers gathered together and invited Dr. Allen and myself down there to talk to them about the control of Bang's disease. Of course, we were glad to cooperate, and we went down and paid them a visit and told them principally the things that we did not know. At the close of the meeting, that group of men passed a resolution in favor of county area Bang's disease control and sent a copy of it to the members of Congress, to the members of the legislature, to the county commissioners and excise board members. We can determine by that that they are interested. More than half of the cattle population of that county has been signed up on these federal and state contracts and are now on the waiting list.

As we continue this work, I think every state sanitary official should see to it first that every animal that is tested officially and reacts to the test is branded as a reactor, because it is not fair for one man who
may be progressive in his thinking and acting to find out the extent of the disease in his herd and then be able to unload on an unsuspecting neighbor.

At this time it occurs to me that it is highly important that all of the blood samples taken for this test should be tested in an official or central laboratory. We are starting to make a few retests or second tests at this time, and we are very gratified with the results.

I recall one herd in which we took out something close to 100 animals, and on the retest, 90 days later, we found only 18 animals reacting. That was out of a herd of some 350 head of cattle, all dairy cattle. In other herds, smaller herds, there was a smaller percentage. I believe in two we found no reactors on the second test. In others we found three or four animals reacting to the test, showing that there is some evidence that we are headed in the right direction.

I should like to see, and I think this organization should sponsor, a uniform regulation for the control of Bang's disease. I can see no reason for the regulation not being uniform since a cow affected with Bang's disease in New York is no different from a cow affected with the same disease in California. Consequently, we should look to a uniform regulation in order that I might tell a man in Oklahoma, who is shipping cattle to Virginia, that we were asked by that state to comply with the same regulation that we would ask of Virginia or any other state. (Applause.)

PRESIDENT ROBINSON: The next speaker is Dr. C. E. Cotton, Secretary and Executive Officer of the State Live Stock Sanitary Board, Saint Paul, Minnesota.

MINNESOTA

Dr. COTTON: Mr. President and Gentlemen: Some years ago, prior to any definite undertaking for the control of this disease, Dr. Fitch, in our laboratory at the University, and who, as you all know, is my boss, my chief, from whom I have to get consent before I can turn around, initiated some work in the control or at least the testing of cattle for this disease.

As Dr. Wisnicky has stated, we older men who have practiced veterinary medicine for the last fifty years or so know what our breeders have had to contend with in undertaking to combat this disease. We all remember, years ago, we were shooting carbolic acid under the skin of the pregnant animal every three weeks. We also administered methylene blue until the cattle were eliminating it through the milk and urine. We continued with all kinds of propositions, thinking we were getting results in herds in which we had the storm, as Dr. Williams described it, of aborting cattle. We all know that, no matter what method we undertook, the storm did recede in that herd. It appeared later in cycles; it did not make any difference what we gave them. We thought we were getting results.

That is the condition today, the results and the good reports we hear from the so-called cures for this disease that are now being and for some years have been exploited among our farmers.

Dr. Fitch, in his preliminary work, demonstrated that, by the use of the blood-test, he could eliminate this disease from herds of cattle. In 1926, our board called a meeting of the breeders. We have a breeders' association in our state, which is a parent organization of all the breeds, and we presented to them the proposition of undertaking to organize some practical method of control, using the blood-test as a means of diagnosis. Naturally, there were a good many skeptics in this breeders' organization, but they were all enthusiastic to undertake it.

We then established a plan somewhat along the line of the individual accredited herd plan for tuberculosis. We had a number of signers
but we did not get results for the reason that it was too prohibitive. In other words, it required, in a majority of farms, maintaining three groups of animals, the positive, the negative and the suspects. We had some of the more progressive breeders, more enthusiastic men, go along with us under that plan, but we were not succeeding in reaching the breeder of average intelligence, because it was prohibitive in a money way.

In 1928, we instituted the program that has been in effect since that time, of establishing Plans A, B and C, the accredited plan, the approved plan, and the C plan. The latter plan is one that any farmer can agree to carry out, in which he will have his animals tested and will carry out the necessary sanitary measures to control the disease. As a result, there was increased interest taken in it by farmers and breeders, particularly the ones who knew that they had this disease in their herds. We were under the impression that we had about 75 per cent of our herds infected, and about 60 per cent of the cattle affected, as a result of some of the first tests, for the reason that we tested the herds where the disease was known to exist.

At the time we initiated Plans A, B and C, in 1928, it was understood that the owners would employ local veterinarians to draw the blood, and the laboratory maintained at the University, in connection with the Sanitary Board, for the diagnostic work, would do the testing without expense to them. We felt that as a control body we should institute control measures in keeping with the service we were extending to the farmers. At that time, we initiated a plan of quarantining but not tagging the reacting cattle. The farmer agreed that these animals would be placed under quarantine, and that he would not dispose of them without a permit from the Board.

The work progressed very rapidly until about 18 months ago when, because of the general financial condition of the farmer, he began to lose interest, and we did not have the successive additions or increases of herds each year comparable to the ones in prior years.

As the work progressed, we changed the regulations requiring the tagging and marking of the known Bang-reacting animals. Our work has demonstrated that the first complete test does disclose the non-productive cows or the so-called “boarders” in the herd. We have been successful in having the owner get rid of his losses, get rid of his reacting cattle without any material financial loss to himself, even under our Plan C or Plan B, allowing him to keep the reacting cattle in the same stable with the negative animals under the best isolation he can possibly provide with the physical conditions on his farm, but insisting that they be kept separate in barnyards and in pasture.

As I stated, the enthusiasm decreased because of the financial condition. I recall that about a year ago last October, when the government was considering assistance to the farmer by decreasing the surplus cattle, the breeders of our state as well as other states began to get busy with their Congressmen to endeavor to induce the federal government that, when they did undertake to start such a plan, they should include in that plan some method of testing, buying, or paying indemnity for the diseased animal, not only for tuberculosis in the states which had not been able to finance the proposition, but also for Bang's disease. You all know the result. All that we regret is that we did not have a LaFollette in our state in order that we could get some of that big money. (Laughter.) I don't know but that we, in our enthusiasm, expected too much. We thought that, when the government did get ready to extend this service, particularly in our state, where we had a large number of counties that were suffering from the drouth conditions, all the farmers would immediately sign this agreement.
We thought that some farmers did not intend to keep the herds clean, but were expecting to get a better price for the Bang's disease animal, because in the drouth relief program the farmer received only $20, and if there was a chattel mortgage against it he got only $6 and the lien-holder got $14. On the other hand, he would get $20 for grade cattle and $50 for pure-bred cattle reacting to the test for Bang's disease.

We were a little alarmed that the farmer would grab this with the idea of simply selling his surplus cattle, and he would not be inclined to go on with the future program. We were agreeably disappointed when the contracts came in and we undertook to sell the plan to the farmer. We did not think it would take much effort to sell it. We thought they would all sign. We found that many farmers had signed on the dotted line with Secretary Wallace so many times that they were skeptical, and they stated they did not want to do business.

We also found they were questioning one of the paragraphs in the contract in which the farmer agrees, after the federal government has extended this service and paid indemnity, to sign with the state to continue that work.

With us, as I stated, they have been compelled to employ their own veterinarians to draw the samples of blood and send them to the laboratory. We found they hesitated because they did not have the necessary financial means to meet that obligation. Our explanation was that it was all elective on the part of the farmer any way, that at any time he could sign and at any time he could withdraw.

The official control work in Minnesota requires the slow tube test. The work that has been done by Dr. Fitch and Dr. Donham has disclosed that, with the antigens they prepare and their methods, the rapid plate test gives just as good results as the slow tube test. In the work that has been done at our laboratory, with the antigens prepared there, we have obtained results that we are proud of.

Since the government work was initiated, prior to November 24 (I haven't the data since that time), we have tested in the laboratory 3,194 herds, containing 50,906 cattle, of which 5,905, or a percentage of 11.59, were positive; 1,070, or a percentage of 2.1 suspicious; and infected herds, 41.96 per cent. Since that time there have been perhaps 15,000 or 20,000 more tested, but I do not have the data.

One alarming thing to me is this: At the present time, we have approximately 35,000 contracts signed in Minnesota. If you estimate 20 animals to the herd, which is a little high, that means we have 700,000 animals. Twelve per cent infection would represent 84,000 reactors, and, at an average of $20, which I think is conservative, considering grade and pure-bred animals, that would mean $1,680,000 necessary to meet the obligation for indemnity alone in the state of Minnesota. I understood from Dr. Mohler that there was $17,000,000 available for Bang's disease control throughout the United States. The way Doctor Wisnicky is going, we won't get a chance to make a retest. (Laughter.)

Dr. Givens stated to me, and I think he so expressed himself on the floor, that in Virginia they have succeeded in making one test and are now making a retest with federal money. Virginia has appropriated more funds for indemnity amounting to $30,000, or $15,000 annually for two successive years.

We have 3,465,655 cattle in the state of Minnesota. Gentlemen, this indemnity feature is just a bit alarming. If we cannot succeed in getting the government to go on with this program and advance more funds, with the $33,000,000,000 we have got to face for taxation in the future, and with necessarily conservative legislatures that are going to meet in most of our states this winter, I hesitate to go in and ask for the necessary indemnities. I think it is a problem that we should all, before we leave this meeting, look at in a practical way and decide what is going to be the policy.
You will all recall that, in our tuberculosis work, when we got into court or somebody objected to the work, the only way we ever succeeded was by explaining its connection with human health. When we got before a judge, the only way we succeeded in having our law sustained, even to the Supreme Court, was that it was a human health problem. All judges, naturally, were inclined to favor such control work.

Our epidemiologists have not yet determined to what extent this disease is producing undulant fever in the human family. In our enthusiasm, let us be a little conservative.

I did not explain that, because of this large number of contracts and the fact that the federal money is available only until the end of December next year, we are obligated under these agreements to hurry up this work. In Minnesota, about 137 or 140 veterinarians have received instructions in Dr. Fitch's laboratory on the technic and the application of the rapid test. Our laboratory will prepare the antigen. They have also educated a number of Dr. Fretz's force and our force to go into the field and work with these veterinarians until such time as we are satisfied that they can apply the test in the field, and they will be required to send their records or their readings of the first few herds to Dr. Fitch's laboratory to have him check them. The field inspectors of the government will frequently recheck them in the field. I hesitate to encourage any more owners to sign, because, as Dr. Mohler and the Department at Washington have expressed themselves to me, they wish to cooperate with us and use these funds to go back and retest the infected herds at least once. You can see where we are landing. We are going to extend the work too far on the first test. Whether we will be able to go back and make any retests unless we have more money is a question.

You men, particularly the control men, have received a letter signed by Dr. Fitch and myself, asking that this group of control men, the federal inspectors in charge in each state and also the laboratory men who are interested, meet this evening in order that we can continue this discussion and in order that we, at this time, can agree upon something uniform for the various states, or at least something that can be recommended for the various states to adopt, to establish the necessary regulations and plan of control of this disease both intrastate and interstate.

You will all recall that, prior to 1919, various states had different requirements for the movement of cattle into the state as far as the control of tuberculosis was concerned, and it required a Philadelphia lawyer to function as a station agent for a railroad and keep posted on the requirements. You will also recall that this organization memorialized the federal government and begged it to adopt a regulation relative to the movement of cattle interstate as far as the control of tuberculosis was concerned.

I want to state that that is the only regulation which the federal government ever adopted in so far as the movement of live stock interstate is concerned, requiring inspection and test. They have required, however, that any live stock affected with communicable diseases cannot be so moved. I think it is right to ask the federal authorities to take the same interest in the movement of cattle interstate, for the control of Bang's disease, as they have for tuberculosis. (Applause.)

PRESIDENT ROBINSON: Before we throw the meeting open to discussion, it has been suggested that we call the states alphabetically and let the sanitary officials of those states talk. If that is the way you want it, we will proceed in that manner; if not, I will recognize anybody who wishes to be heard. All in favor of taking up this matter state by state will kindly raise your hands; those opposed. I guess we will take it state by state.
I am going to ask Dr. Wight to call the states in alphabetical order and name the state official.

Dr. Wight: Alabama, Dr. C. A. Cary.

Alabama

Dr. Cary: Gentlemen, in a few minutes I will tell you what we have done in Alabama. We have always made our own antigen and have gotten the strongest cultures from Washington, every one of them from Dr. Cotton. We did not have any outside antigen from any place.

We tested over 40,000 meat animals that came into Alabama. We tested everyone of them for abortion and tuberculosis. When we got through with that, we threw out all the sick ones, and the rest of them we dipped to keep out the ticks. We are the only state that did that.

That was all done at one place, with one set of men, paid by the United States Government, with the exception of my salary.

We did that first. When we got through with that, we started this abortion matter. We still made our own antigen. We have used the long test, the tube test, and we don't want any other. I want to say that the regulation of Alabama does not accept any other test for shipment into the state. Get that clearly. When we catch you doing that, we throw them out. Notwithstanding that the government may put them inside of the state, we quarantine them the minute they get in here. I have regulations and laws strong enough to do that, and I have had those laws for 43 years in the state of Alabama, and they are not going to be changed by any of you outside states. (Laughter.)

I want to tell you that we are doing just about the same that the rest of you are doing. We are trying to educate the people. Like a good many of you, we are getting more applications for the test than we can handle. We are limiting it now to the large herds. We are not testing any of the small ones because we want to distribute it over the state. We are not only testing dairy cattle but we are testing a great many beef cattle.

Just the other day we got an Angus herd, one of the best herds in the state, where we got a large percentage of the animals, and the owner did not know he had any of it in his herd. What did he do? He killed the bull. He paid $500 to $1,000 for it and sold it to the government for $50. That is what he did. He is right up here at the stock yards. I was down there the other day to see him. He is buying another one. That is the kind of grit he has. When we get them behind us like that, we can do something.

I want to say a few words about uniformity. I don't know whether we are ready to go into uniformity. We don't agree enough. I don't mind telling you that I was 73 a week ago, and I have been all through this development in tuberculosis work. What did we do in that? We had the same fight. We couldn't get over to the intradermal test. For years I wouldn't let a man test intradermally in Alabama. Why? We didn't know it was all right until they proved it. We stuck to the old subcutaneous method which we knew what we could do and get results. When we get something worked out in the abortion test like the intradermal tuberculin test, we will be ready to adopt it.

I am not an authority, and I don't want to tell you all about it, but we have to use some definite method in each state, and all the states when you get at it, as we did with tuberculosis. Where will we get this antigen? The United States Government makes every bit of the tuberculin that we use. It is standard. The United States Government has either got to make this or give us a standard to work with, if we are going to adopt a standard method. You fellows who have not had the experience with state work that I have had may not know what
you have to run up against, but those of you who have had it, know what you have got to do.

I do not let any other antigen come into Alabama, and I know then that we get the same result in every herd that we test. We test every bit of antigen before we use it. It is tested on our known reactors and non-reactors. Then we use it. We know it is uniform.

I don't want to give you any advice. Some people say, "You are going to advise somebody when you don't know all about it." I don't know all this stuff. We are now doing this testing. We are letting the people decide what they want done. We are going out with a second test if the money lasts, and, if it doesn't, I am going to try to get an appropriation from the state to go on with this. Then I want to look after every other detail of disinfection and cleaning up to keep these herds clean, and after a while we will get somewhere, but I doubt whether you are ready for uniformity now unless you can agree on one thing right now as to where you get your antigen, how you make it and how you use it. (Applause.)

DR. C. E. COTTON: Dr. Cary, I would like to ask you what percentage of tuberculosis you have had in the relief cattle brought into Alabama.

DR. CARY: On the first trainload that we got in there the government agreed to test them for tuberculosis and abortion, if I would let them come in. You say I can't keep the government out! I kept them out. (Laughter.) When I told them to stop, they stopped bringing those cattle in there. They can bring them inside of the state, but the minute they get in there I can slap a quarantine on.

I can't give you that offhand, but in the first trainload that came in there were thirteen carloads of cows that had pass tags, suspect tags, and every other kind of tag in their ears. After the government agreed to test them, I was ready for them. I made them come into one stock yard, and when I got them there, I had my men ready and we tested every one for tuberculosis and abortion, and I got so many reactors in that first thirteen carloads that I wouldn't let another train or car come in without retesting.

DR. COTTON: How many reacting cattle did you get?

DR. CARY: I can't give you that offhand, but in the first trainload that came in there were thirteen carloads of cows that had pass tags, suspect tags, and every other kind of tag in their ears. After the government agreed to test them, I was ready for them. I made them come into one stock yard, and when I got them there, I had my men ready and we tested every one for tuberculosis and abortion, and I got so many reactors in that first thirteen carloads that I wouldn't let another train or car come in without retesting.

DR. COTTON: What percentage of tuberculosis did you get?

DR. CARY: We got between 2,000 and 3,000 for abortion, and out of the 40,000 or more that we tested we got 500 tuberculosis reactors. A lot of those had tuberculosis reactor pass tags in their ears. I want to say to you that they did not by any means all come from Minnesota. Some of the first trainloads that came in had cattle from North Dakota to New Mexico.

DR. COTTON: I want to square Minnesota. What I referred to in my wire was South Dakota cattle concentrated in one of our public yards. They were supposed to be tested before they went out, and, through some mix-up, the veterinarians were not allowed to make the readings. That is why I wired Dr. Cary. The cattle he got from Minnesota were not Minnesota cattle. They were cattle from other states.

I wish to state that one reason why we feel we should have this meeting tonight is to talk about uniformity. If we only had Cary's to deal with, we would never get anywhere. He says we cannot have uniformity. I feel we should at least get something basically uniform, so we won't go off on too wild tangents.

DR. WIGHT: The next state is Arizona. Is Dr. Guilfoyle in the room? (Absent.) Arkansas? I don't think Dr. Stubbs is here. California, Dr. C. U. Duckworth.
Dr. Duckworth: Mr. Chairman, many of the things that we are discussing here no doubt are of paramount importance. Uniformity is, no doubt, of paramount importance in any sort of regulatory work, but that uniformity, whether it should be applied at the present time to regulations or whether it should be applied to our methods, is debatable. In my opinion, what Dr. Hisel said about doing our laboratory work in a laboratory is advisable. I am in favor of giving the veterinary practitioner everything we can, but I am rather inclined to feel, from some experiences we have had in my state, that we would be handing him a left-handed bouquet if we put this work into his hands to do out in the field.

Yesterday we listened to some discussion as to whether or not a box was to have a lid on it. Do we have some evaporation? Well, I don't want to seem to be boasting about California, but in those valleys in the summer time it is hotter than hell, and I am rather inclined to feel that the average practitioner might try to conduct tests through our so-called rapid or plate method and get confusing results, and those confusing results would be disastrous to the live stock man whom he was endeavoring to serve. Too, we have had specific instances out there of tests in laboratories of an antigen that was not proper. I have in mind a particular test where the laboratory in question had not conducted any tests for a long time. A man took some blood up there and wanted to know if they had some antigen. Yes, they had some antigen but they did not think it was any good. "Oh, that is all right." That test stands today as contrasted against the test at the University and in our laboratory.

They gave a much smaller number of reactors. The wish of the live stock owner was that he would have a small number of reactors. While the tests at the University and in our laboratory checked in every detail, we are wrong, and the man who found the small number of reactors, due to faulty technic, is right.

I am rather inclined to feel that the work belongs in a laboratory. I am sure we should have all the diagnostic methods that are available to us as practitioners, if that is what we are doing. But the average physician does not read his x-rays; he depends on the man who is doing that. The average dentist does the same thing. My wife happens to be a dentist, and she consults with the man who takes the pictures. She does not decide herself what should be done in a mouth, with that x-ray. The average physician does not make his own Wassermanns, and we shouldn't. So why should the veterinarian out in the field, under hard conditions, give himself a kick in the pants, in my estimation, by conducting a test that he cannot absolutely rely on?

As to regulation, the statement was made here today by Dr. Fitch, I think, that there were seven states that had no regulation. We have had requests in California to institute regulations providing for excluding any animals other than those negative to the one test.

In order to comprehend what we would be up against to do that, we have to take into consideration our problem of tuberculosis. We like to boast in California, you know. My good friend, Dr. Faulder, told me in the past, at some time or other, that he has taken 150,000 tuberculin reactors out of the state of New York. I want to tell you gentlemen that that puts California in the lead. We have more tuberculosis than any of them. We have the job to clean that up. In some of our sections dairying is the sole industry. We are literally going to paralyze some communities in taking out the tuberculin reactors.

We do not feel that the time is ripe for us right now to ask the man who has to go out and bring in replacements and throw them in with herds that are untested for abortion disease, to pay the additional fee
that he will have to pay for cattle negative to the blood test. Maybe the idea is wrong, but I think it would cost our dairymen a lot of money. With the indemnity they are getting from the federal government and the salvage they get, considering the fact that the State of California, due to its financial condition, cannot pay anything additional, the dairymen aren't getting enough to have an additional price added on there.

I think we have to consider very seriously the economic angle and what the dairymen is going to get out of the thing before we impose too stringent a regulation on him.

What Dr. Cotton has said about legislatures and the difficulty of getting money is correct. Since I have been in Chicago, I have received a wire that the proposed budget we put in has had some of the money that we asked for to continue tuberculosis eradication taken out. We are going to have to go back and make a battle for that. But I just doubt that we could, by any stretch of the imagination, get enough money out of our various legislatures to continue this work.

I feel that we in California are going to have to carry it on as an educational program and endeavor to get the men there to try to build themselves clean herds rather than depend on appropriations, either by California, or Uncle Sam, to do the job for us. (Applause.)

Dr. Wight: Colorado, Dr. R. M. Gow.

Colorado

Dr. Gow: A year ago, I came before this Association for the first time. That was when we were trying to get the western cattlemen to clean up tuberculosis. We have accomplished it. I was trained in a state adjoining Dr. Cary's, on ticks.

I wish to state today that we are working on tuberculosis in 33 counties in Colorado. The county agents are causing us to do abortion work. I have tried to get them to lay off it. I advise pure-bred breeders to undertake the work for the reason that they have to sell their cattle interstate. We are like California. We have no regulation at the present time prohibiting abortion being shipped into our state. I feel that a uniform regulation should be adopted by all states. At the present time we will do some Bang's disease work. We are putting it up to the owners that it is their individual problem. They figure it is a good plan to make one test to reduce their herds. If they simply want to sell cattle to the government, I tell them that the Bang's disease program is a good one. In our state we have at least 25 per cent reactors.

Dr. Wight: The next is Connecticut, Dr. E. R. Dimock.

Dr. Dimock: I will call on Dr. G. E. Corwin.

Connecticut

Dr. Corwin: We in Connecticut are very much interested in the eradication of Bang's disease. We have our problems just the same as you people in the other states. We have not as yet made up our minds that it is quite time to put severe restrictions on cattle, that is in so far as requiring a negative test, due to the fact we do not have any place to put them. With us I think we must prepare a place to put them before we make certain demands. However, we believe in uniform rules and regulations.

We feel now that in the herds that have been cleaned up, most of the pure-bred herds, the owners of such herds will take care of themselves, and they will see to it that they get only cattle from herds free from Bang's diseases.

We have a state plan which is not a very severe plan, and then we have a plan of private testing. A man may bring his herd up to the
point of accreditation, sign a state application agreement, and, if the records of the test can be approved and the animals properly checked out, he can become accredited on one test. The only requirement we have on the private test is that all laboratory tests must be reported to our office. We at this time do not quarantine or put any restrictions on reactors.

With reference to the AAA plan, we were of the opinion that when it was put into force our breeders would not take to it very kindly, and when I say that I mean that, while they were anxious to eradicate the disease from the herd and would do so if they could receive proper indemnity for their animals, I am quite sure at the time, and it turned out to be so, the indemnity in our case was not enough. You must remember that we are an importing state, and on the animals which we procure, we must pay the apparent value placed on them in other states, we must pay the cost of transportation and we must also pay a commission.

We have tested quite a number of herds, mostly pure-bred herds, under the AAA plan. The only thing that is holding us back is the amount of indemnity the owners are getting. (Applause.)

DR. WIGHT: The next is Delaware, Dr. R. M. Sarde.

DELAWARE

DR. SARDE: We have had a state plan in Delaware since 1929. Of course, since the AAA plan came out, we have done considerable work under that. We are more interested in the standardization of the antigen, furnished either by the federal government or to set up a standard for us to go by, than any other one feature. Of course, we are also interested in paying for the third and fourth tests until the herds are completely cleaned.

DR. WIGHT: Florida. Anyone here from Florida? (Absent.) The next is Georgia. (Absent.) Idaho. (Absent.) Illinois. I see Mr. J. P. Stout is here.

ILLINOIS

MR. STOUT: Mr. Chairman, Illinois has been operating under rather a gentleman's agreement for a good many years. It approached very nearly the method that Dr. Larson explained they use in Wisconsin, that is, as far as regulations were concerned. It is purely voluntary, a cooperative agreement with the herd-owners. Nothing was done to push that especially. There are just a few over 1,100 herds in Illinois. Of those, just a few hundred have maintained active herds; that is, the financial situation caused some of them to drop out. Of that number, about 100 are accredited herds.

When the emergency program under the AAA was instituted, the State of Illinois and the federal department went into a cooperative agreement. I will admit that in this project in Illinois we have not done a whole lot of work compared with Wisconsin and some of the other states, but I am not ashamed of that admission, either. We felt that this work was absolutely constructive. We wanted it to be carried on in such a way that the results would be a credit to the whole program and not create dissatisfaction which later might interfere with the project within the state.

We felt in Illinois, and I think Dr. Cotton said he has the same feeling, that the blood test is a laboratory proposition for really skilled technicians, and the blood test in Illinois is being handled at central laboratories. At present we have two, one in the northern end of the state, where the cattle population is largely dairy and is heavy, and another one in the central part of the state.

The antigen for these tests is all prepared at the laboratory at the University of Illinois, which is operated as a cooperative laboratory.
between the State Department of Agriculture and the University of Illinois. Of course, we feel that uniformity, especially in making the test, is essential.

Up to November 22, which is the last day for which I have complete reports, we have tested 1,373 cattle, with an average of practically 23 per cent reactors. There are at present approximately 1,000 herds, on which contracts were signed, on which tests have not been made. As I say, we are not urging this test on the men. We are giving them all the information we can, where they request it, hoping that before they sign the contract they will thoroughly understand it, understand the obligations they assume to go along with this project which is at present in existence in Illinois, understanding that there may be difficulties arise, that everything will not be just the way they hope it will come out, and realizing that the state and the federal bureau are doing everything to make it just as nearly right as possible. We hope to have appropriations from the next legislature by which we can carry on the work in that manner.

On the question of indemnity, which has been mentioned, and I am speaking here also as a herd-owner, I am sure Illinois could not afford to put up the money to pay indemnity for all reactors. To my mind, this is largely a dollars and cents commercial proposition with the herd-owner rather than a public health measure. I question whether it is logical for a state to pay indemnity. I feel they should, in the endeavor to stamp out and control the disease, furnish part of the cost of the test being operated at the present time. I do feel there should be some uniformity in interstate movement of cattle both on the abortion test and also tuberculosis.

Dr. Wight: Indiana, Dr. J. L. Axby.

Indiana

Dr. Axby: Mr. Chairman, I think that most of you are aware of the fact that for four years Indiana has had a clean-herd plan. We have approximately 115 or 118 clean herds in Indiana. That was entirely a free-will proposition on the part of the herd-owner. That has been very conducive, relative to the primary education leading up to the situation confronting us today, wherein Indiana is cooperating in the federal program.

In that respect, up to November 30, 1934, there have been tested, under the federal program, approximately 11,500 cattle. There have been 2,000 reactors. The percentage of reactors is 17. The percentage of infection as determined under the clean-herd plan was about 24. The signed herd-owners' agreements on hand at this time are approximately 1,000, comprising somewhere in the neighborhood of 10,000 cattle.

I might say to you, from the standpoint of interest in Indiana, that I am surprised. Dr. Busman, federal inspector in charge, is absolutely swamped with applications at this time. I did see the time when my correspondence increased ten to twelve times, necessitating many days to elapse to get the desk cleaned.

There are many things about this, however, that are possessed of elements of worry, as far as I am concerned. Incidentally, in passing let me just recall this: The gentleman from Minnesota took exception to the amount of the remuneration, I might say, that was going to the herd-owners in Wisconsin. Not to take the part of either one, however, I am inclined to come to the conclusion that the point is not well taken when the individual who makes that point adopts the results of a plan which was conducive to the very things about which the objection was raised.

In Indiana, we are not in any way endeavoring to push this plan. We receive, I might truthfully say, hundreds of requests for appearances, to come out to discuss this. That we cannot do, of course, but
we do go wherever it is convenient to go. There we have meetings arranged by local veterinarians, mostly, perhaps, by the county agricultural agents, in which this is explained to them. Many times Dr. Busman and I go together. I take Bang's disease, and then he takes the federal program. Always in this hook-up, without going too far, I do not overlook the undulant fever angle because of the fact that in Indiana the State Division of Public Health is very sensitive relative to undulant fever. Indiana is having every year more and more undulant fever. In the office now known as the Director of the Division of Public Health, which used to be the Secretary of the State Board of Health, there is a young fellow who has had the benefit of a great deal of experience and education in Europe and who has given this a great deal of thought, and with whom my department enjoys a very fine cooperation. He is exercising his influence relative to the health commissioners in the counties and the health officers in the cities, as a result of which city after city in the state of Indiana is passing an ordinance wherein no milk can be used unless it comes from herds that have been tested for Bang's disease, unless that milk is properly pasteurized.

That, again, is making the people conscious of the things they must meet very soon. In other words, those are just shadows that are now seen, and coming events cast their shadows before.

We find that this thing is meeting with better cooperation than we anticipated in the beginning. One of the things we have to meet, of course, is what is going to happen when the federal government steps out, and I have practically all of them in my lap or in the department's lap?

I believe I can say to you truthfully, in view of the financial conditions that exist, in view of having to find new avenues of revenue, different, entirely different, than we ever used or tried before, and which determination, from the standpoint of satisfaction, has not yet been reached, appropriations will not be asked for in Indiana relative to the indemnifying of cattle-owners after the federal program ceases. I think the herd-owners in Indiana, not all, of course, but a great many of them, a majority at least, will continue to operate under this plan exactly in accordance with the contract and join up with us as times become better, as the days become brighter, as taxes can be derived more pleasantly from these people, and in time we will work this out to the satisfaction of everybody.

Before I close, I want to say that we are operating with a central laboratory, enjoying that pleasing and fine cooperation from the Agricultural Experiment Station at LaFayette, the veterinary department there in charge of Dr. R. A. Craig, whom many of you know. We have that fine cooperation. We are using that central laboratory.

I believe we should have some unification of regulations. I see no difference between one state and another. I also think there should be a standardization of the antigen used. (Applause.)

DR. WIGHT: Iowa is next. Dr. H. A. Seldell.

IOWA

DR. SELDELL: Mr. Chairman and Gentlemen: In Iowa we have been doing a limited amount of work since some time in August. In the month of August we tested about 424 head of cattle, in September 3,000, in October 4,000 and in November 10,000. So you see there is a gradual increase. Our blood samples are sent to the central laboratory in the veterinary department at Ames. I might say that in the amount of work we have done so far in the state we have had about 20 per cent of reactors. One reason we probably have not had more is that in Iowa our particular problem has been tuberculosis eradication work.
Before we take the samples of blood from cattle, the owners are required to sign the state agreement. We also try to explain to them not only the good points of the test but the problems, in addition to that.

I guess you men probably know that each Sunday night in Iowa a man broadcasts all of our doings, so there is not a great deal of necessity for us to tell what we are doing. (Laughter.)

DR. WIGHT: Kansas, Mr. J. H. Mercer.

KANSAS

Mr. Mercer: Mr. Chairman, there seems to have been some things omitted here this afternoon, as far as this abortion program affects our people. The state department at Kansas has done a lot of experimenting in abortion testing for the last six, eight or ten years. They have no regular methods for the disposition of reactors other than the suggestion that they be disposed of, and the general sanitary clean-up of the infected farm.

A number of our cities have city ordinances which have been referred to here this afternoon. We in the departmental work have tried to relieve the situation by having our dairy herds tested at state expense. Then the owners of pure-bred dairy cattle in our state have had quite a lot of testing of their own herds done by their local veterinarians. The question I bring to you is this: They do not seem to get the same results. There is a lot of dissatisfaction. I know of a herd of cows that was tested under a guaranty retest, and all of them were negative. At the end of 30 days, they were tested by another laboratory and they were all negative. I sent those records to our laboratory at Kansas City. That condition has made a lot of our people skeptical as to the merits of this test. Furthermore, we had a test made under this contract program that we are discussing here, for a herd of Angus cattle, a very outstanding herd in our state. The man didn't know he had any abortion in his herd. He said he had a 100 per cent calf drop for the last four years, and we took 27 per cent of his herd. Of course, he has got to go on through with it. In this federal program we are recognizing no test except that at the laboratory at the state college.

I think the question that was raised by the gentleman from Alabama is a good one. The federal government ought to standardize this test, and then let the state authorities stop all other tests, or else standardize a commercial antigen that we now naturally suppose is all right. That is one thing that is disturbing the minds of a lot of our people.

Here is another proposition for this test out our way, and I expect it is so in quite a number of your states, and that is the fact that, due to the drouth, we have more cattle in Kansas than we have feed, especially in the western half of the state. The allotments under the drouth program have been too small. We have not been able to get rid of the cattle that have been offered for sale. I understand, since I came here, there have been some further allotments made. I hope that is true. In any event, the man who has a considerable percentage of abortion cattle gets very much the better price under this method of appraising the cattle and returning the salvage to him than he does through the direct buying of the cattle for relief purposes. Quite a large number of our owners are petitioning for and signing this contract to have their herds tested, due to that situation. We had a herd of 900 head tested a few days ago. There were 185 reactors. The man himself told me he was sorry there were not three times 185, because he said he got very much more for his cattle than he would if he had turned them over to the federal relief plan. That is about the situation out there.
As far as the percentage is concerned, we tested something like 40,000 to 60,000 head of cattle over the state, in different places, and the percentage ran a little less than 12 per cent, and we think it is pretty fair, because we have tested quite a number of cattle down there through the drouth relief program and find that it runs just about the same. On the drouth cattle that come into Kansas, our local men made a contract with the government to test 20,000 head, and then it was stopped. I don't know what Alabama got. We got ten cents a head, and they made money. As I heard, they got forty cents down South. I don't know whether that is true. I don't know whether they came from Minnesota, but it was less than one-tenth of one per cent in that bunch. Some of them were not tested.

We tested the group of cattle for subsistence cattle left in the state, and the state tested about 1,600 or 1,700 of them and the government finished the test, 132 or 134. The relief director told me yesterday that the percentage was practically the same. The test the government made was through the laboratory at Manhattan. The other test was through two different commercial laboratories. Evidently the antigen there and the results of the test were just about the same. Surely there ought to be some standardization of the test, because I know by experience, running into the thousands, that testing them this week under one method and then in a month from now testing them under some other conditions, you get opposite results, and that is confusing, especially to the layman; it is confusing to me, and I am a layman, but I have been in this sanitary business pretty nearly as long as my friend Cary. It will soon be twenty-four years since I started in on it in Kansas, and I hope to live out the twenty-four years, which will be next April.

Of course, I feel that we should not undertake to formulate any uniform regulation at this time. If that is going to be left open for discussion tonight, I won't discuss it. We should have a uniform method but we should not have a uniform regulation. I would leave the regulations open. I have a good deal of authority under the sanitary laws of Kansas. When I get hold of states like Alabama and Pennsylvania, I want it open, so I can stick back on them what they stick on me. (Laughter.) Going out west they are pretty liberal. I heard one thing this afternoon that I never heard before in my life. I never heard a man from California admit before that there was anything wrong with the state of California. (Laughter.)

We are getting along very nicely with our tuberculosis work. I do hope, like some of the rest of you, that this good government fund will hold out until we get Kansas on the free list. We have 24 counties; we are following them up, appraising them. If we get through with it while the funds last, we will be glad of it, and then we can take the abortion program later.

**Dr. Wight:** Kentucky, Dr. D. E. Westmorland.

**Kentucky**

Dr. Westmorland: The conditions in Kentucky are very similar to those in surrounding states. Our government program is advancing and is satisfactory. On our tuberculosis work, of course, we are an accredited state, and we have the reaccreditation of our counties. We think the abortion program will terminate with the end of the government work, and our state program for an accredited herd plan, disease-free herds, will be kept up.

**Dr. Wight:** Louisiana. I am quite sure Dr. Flower isn't here. I don't know anybody here from Maine. Maryland, Dr. Buckman.
MARYLAND

DR. BUCKMAN: Prior to the inauguration of the federal program in Maryland, there was a state plan in use for four years. Rather satisfactory progress has been made in the state under that program, consistent with the economic conditions of the time. Under that plan the practitioner does the actual work in the field, takes the samples and sends them to the laboratory where they are tested free of charge. The tube test alone is used.

No particular effort has been made to put across the federal program in the state. The effort has been to follow up the federal program with the state plan. There have been around 2,500 cattle tested under the federal plan. The percentage of infection runs about 15. We hope, with the removal of the reactors under the federal plan, to take on a number of those herds and continue to complete eradication.

DR. WIGHT: Massachusetts. Is Mr. Gillett in the room? Dr. Harry W. Peloe.

MASSACHUSETTS

DR. PEIRCE: Massachusetts has had an accredited abortion-free plan for the past four years. I think, considering the number of cattle we have, we are probably progressing about as much as the other states. We have about 30 accredited herds at the present time. Under the federal plan, which is under the supervision of Dr. E. A. Crossman, we have been rather surprised, as I think he was, at the number of people who are availing themselves of that plan. It only shows that if the owner can get something for his reactors, we are going to get ahead a great deal faster than if he gets nothing.

The plan that Massachusetts is conducting is entirely at the expense of the owner of the cattle, with the exception that we make the examination of the blood without expense.

Regarding uniform regulations, I think we all would like to see the day arrive when we can have such a thing. Massachusetts is practically wholly an importing state. We have slightly over 200,000 head of cattle in the state. During the past year we imported about 35,000 cattle. Fifteen per cent of our population today was imported during this past year, and if we had to have a uniform regulation requiring that all importations must be blood-tested animals, and take into consideration that over 80 per cent of our importations come from three states, Maine which, prior to the federal plan, had no plan relative to abortion, Vermont which was doing nothing on abortion, and New Hampshire which has an abortion plan, you can see how far we would go in getting proper replacements in Massachusetts.

DR. WIGHT: Michigan. Is Dr. C. H. Clark here? (Absent.) Mississippi, Dr. C. E. O'Neal.

MISSISSIPPI

DR. O'NEAL: I want to say for Mississippi, and for Dr. Cotton's benefit, that the drouth relief cattle shipped into Mississippi reacted 1.6 per cent to tuberculosis and 3 per cent plus for Bang's disease in the female cattle.

DR. WIGHT: Missouri, Dr. Hugh E. Curry.

MISSOURI

DR. CURRY: Mr. Chairman, years ago I believe the state of Missouri, under the able leadership of Dr. D. F. Luckey, blazed the trail that led us out of the wilderness and showed the way to eradicate tuberculosis through the medium of the Intradermal test. It looks like our friend Wisnicky, from Wisconsin, ran off with the bacon as far as Bang's disease is concerned.
In Missouri we have a plan under which accredited herds are established. The plan has been in operation some four or five years. We have about 40 herds, I believe, that are known as accredited-plan herds. The Bureau is carrying on some work in Missouri on the plan known as the AAA plan. In some localities the program, as I understand, is being well received. At the moment we do not have any regulations on Bang's disease with the one exception that no known reactor may be shipped into the state of Missouri except under special permit, and not many of our breeders wish to import a known reactor. Therefore, we don't have, we may say, any regulations governing Bang's disease in the state of Missouri.

I heard almost every speaker attempt to show the need of uniform regulations. I hesitate even to recommend any regulation until we find out who will be the Moses to lead us out of this jungle of Bang's disease.

Dr. Wight: Montana, Dr. H. F. Wilkins.

Montana

Dr. Wilkins: We are from the land of the great open spaces. We have a state about 700 miles long and about 304 miles deep, about 37,000 ranches and farms, about a million and a half of cattle, and about 40 veterinarians, of whom about 34 are really in active field service; that is, they could be. So you can imagine that we cannot get very far in the control of Bang's disease. We are doing as much as can possibly be done with our small personnel.

Up to the time shortly before I left, we had tested in the neighborhood of 8,000 head of cattle, of which about 15% percent reacted. Before this set-up was in operation, like most other states, we had a Bang's disease program and tested a good many thousand head of cattle and did quite a lot of eradication and control work, which has really made that set-up go over much faster than we could take care of it.

The thing that is bothering us fellows out in the West is the fact that Wisnicky and Cotton are going to have all the money spent before we can get started.

We also hope to be able to continue testing our cattle for tuberculosis. If we were to test all the cattle in the area which is still untested, I doubt if we would find to exceed one-fifth of one per cent reacted. Unless Dr. Wight or Dr. Mohler can see fit to give us a little additional personnel, it is going to take us some time to cover this territory.

Our people in Montana are very much in favor of eliminating Bang's disease. The thing is there are so many of them wanting the work done, and not necessarily with the idea of selling the cattle. Naturally some want to sell cattle, but the people for whom we have been testing want to get rid of Bang's disease. Many of them are individuals who have tested before, some of whom have kept their reactors hoping the prices would be better. But, for the most part, we are confining our limited activities to individuals who are really anxious to get rid of Bang's disease.

I think that as time goes on we will be able to expand our work some, and we hope to be able to eliminate this disease from most of the herds which we will test.

Dr. Wight: Dr. A. H. Francis will tell us a little bit about Nebraska.

Nebraska

Dr. Francis: We happen to be one of the states that do not have any regulations relative to Bang's disease. Practically no work on Bang's disease has been conducted within the state with the exception
of a few of the state institutional herds. Therefore, until the AAA program began, very little was known relative to testing for Bang's disease among the stock-owners in general. We have purposely held back the Bang's disease program because of the drought work but have started it in a small way. We hope to be able to confine the work largely to herds the owners of which are interested in eradicating the disease rather than reducing their cattle herds.

One of the things that causes the cattle-owner to hesitate many times is the uncertainty of what program may be put into effect that they would have to follow in the future. We have no program at the present time. We have a new state administration that will come in the first of the year, which we believe will cause this work as well as tuberculosis eradication work to make great progress in the near future.

DR. WIGHT: Nevada, Dr. Edward Records.

NEVADA

DR. RECORDS: Prior to the present drive under the AAA plan, we had a fairly rigid plan in our state for individual herds, with a rather large percentage of what you might call the eligible herds already participating. So the chief effect we have had in this new drive is perhaps to stimulate that in this way, that owners who had been inclined to go into the state plan but were not quite able, they thought, to make the necessary financial sacrifice to do it, now can, even though they may only have assurance they will be helped over the first hump by getting compensation for their reactors on the first test. We have not pushed the thing very hard. We have tried to keep it on a scale where we thought the men who signed up were doing it understandingly and in good faith, and, as far as their intentions were concerned, at least, they would go through and on with the state plan, if and when the time would come that the federal funds would have to be eliminated from the picture.

The federal indemnity paid plus the salvage have, as far as I know, been thoroughly satisfactory to the owners in our state. They represent a decent proportion of the replacement cost.

The testing is being done at the central state laboratory under a standardized method. We have not had any trouble in that connection.

We are still one of the states that does not have any interstate regulations. The reason to date is that we have not felt the great need of them. We are not particularly an importing state, especially as far as dairy cattle are concerned. They have been going out rather than coming in. As some of the other men have said, we also did not feel the need of them until we had a little better line on our own conditions and enough clean places to bring cattle. Of course, we realize that in the course of time we are going to feel the need of some. We are still inclined to go a little slowly, in fact, more or less feeling hopeful, at least, that before we are urged to do anything more, some federal regulation will be adopted, which, even though it might be sort of a minimum requirement, can give us perhaps enough protection for our own purpose, and that will itself standardize the state regulation problem for us.

As far as the herds under test now are concerned, the people who own them are under the same obligation, not to bring untested cattle into the herd from out of the state, as they are from within the state. We do not know enough about the condition of cattle outside of the supervised herds.

DR. WIGHT: New Hampshire, Dr. R. W. Smith.
Dr. Smith: Mr. Chairman, New Hampshire has been working under a plan of its own since 1928 and prior to that the individual herd-owners established clean herds under rules and regulations of the Department.

In 1928, several of our breeders, before shipping cattle into various states, wished a state plan; that is, they wanted to put their herds under supervision. While our cattle population is not so large in New Hampshire, yet we have some of the best pure-bred dairy herds in the United States. Naturally these breeders wish to have a high standing for those herds. We have been criticized somewhat for the regulations that we have governing these herds; that is, some officials have told us they were very strict. Before a herd can become accredited in New Hampshire, it must pass three clean tests, said tests being made not less than four months nor more than six months apart. Our state law does not allow owners to sell known reactors to the agglutination test or animals that have aborted, except under special permission from the Department. The only permission we give is for immediate slaughter or to go into known infected herds under quarantine.

We, as you know, have a modified accredited area; that is, we cleaned up our tuberculosis in 1933. Therefore, we have not pushed the abortion plan at all until right now we are planning to go ahead with the program. In fact, we have gone ahead under the government plan. We have every reason to believe that the demand for the test is going to be fully as great or greater than it was for the tuberculin test in the early days of the tuberculosis eradication work.

Relative to indemnity, I think perhaps there will be a movement on foot this winter for some state indemnity. Whether or not that will come about is a grave question in my mind.

Our regulations are not too strict relative to importation. Of course, we do not allow any known reactors to come into New Hampshire. We were requested by our dairymen’s association to put a regulation in force some three years ago—preventing importation into New Hampshire of anything but cattle from clean, abortion-free herds. We did not adopt that regulation for economic reasons. We ship out ten times as many cattle as we import. They go principally into states that have no regulation of that kind. We did not feel it was policy to prohibit the importation of cattle from these states into our own state, when we wished to ship a lot of ours interstate. So we have no regulation prohibiting the importation of cattle except known diseased animals.

With the farmers it is not a case of getting rid of their cattle. That is not why they are signing up for this program. They do not have any cattle they want to get rid of up in New Hampshire other than to sell for a profit. Their reason solely, if they do sign up, is because they want clean cattle and clean herds.

This report that has been passed around here, as of November 1, is a little misleading and yet it is true. While I see New Hampshire says they only have one herd tested, I guess perhaps that might be right up to the first of November, but since that date several hundred herds have been tested. The surprising thing, at least to us, was this: While all of the farmers, or practically all of them in the state, and everywhere you go, in the past four or five years, where this has been discussed, have said, “Oh, you are going to get 35 or 40 per cent when you get into abortion, it is the worst disease of all,” in fact, in veals, new herds, and herds that farmers suspected had a lot of trouble, we were getting only about 12 to 15 per cent. Many farmers have been so surprised that they have had to have smelling salts to revive them.
after the test was applied, because they thought they were going to lose 50 or 60 per cent of their cattle. As a matter of fact, they lost only a few. I have no fear relative to this test.

Back in 1929, we checked with several laboratories, and there were some discrepancies. We immediately instructed our state veterinarian to get in touch with Dr. Cotton and his laboratory at Washington and adopt his technic and his antigen and stay with it. Regardless of what other laboratories might reveal on tests of blood sent to them by farmers or veterinarians, the results of our own laboratory are taken and those alone.

It seems to me that, if our United States Department of Agriculture is to be the leader in these disease-eradication programs, we should follow along with them, and I think if we do there will be no trouble whatever.

Dr. Wight: New Jersey. Is Dr. J. H. McNeil in the room? (Absent.) New Mexico, Dr. F. L. Schneider.

New Mexico

Dr. Schneider: Many of you know that New Mexico is essentially a range state. We are producers of range cattle, primarily. Being producers of range cattle, of course, we are sellers of range cattle.

The dairy industry, however, in New Mexico, has certainly been greatly increased during the last ten years. I might say that during the last decade New Mexico has perhaps become one of the greatest homesteading states of those states which still have government land to be obtained in that way.

Coincident with the homesteading of lands, there has developed in our state quite an impetus in dairying. We ship quite a large quantity of dairy products out of the state to nearby states.

The sanitary authorities of New Mexico wished me to bring this word to you, that they stand ready to do anything that is necessary in connection with the furtherance of the Bang's disease program. They feel, perhaps, that the time is very propitious right now to do this work, for this reason: In the first place, we are just now undergoing one of the most serious droughts that has ever been known in New Mexico. It is beyond anything that has been known even by the oldest settler. It means at this time that the dairy herds, of course, are going to be considerably depleted, especially those on what we call the dry-land farms.

Looking forward to the time when these herds are going to be increased, New Mexico feels that the time is propitious to tackle this problem of Bang's disease now as never before.

As I stated a few moments ago, New Mexico is a seller of range cattle. On the other hand, we are going to become a purchaser of dairy cattle. We will probably have, during the next several years, very few cattle to send outside the state. We are therefore interested, in the first place, in getting rid of Bang's disease, and, secondly, in keeping the disease out of the state.

I think the livestock sanitary authorities are profiting by the experience we had in dealing with tuberculosis infection some years ago. New Mexico believes that she was very materially benefited by having stringent regulations which were started at least 20 years ago in requiring the tuberculin test of cattle coming into the state. Profiting by that, as I say, she wants to be quite particular on the dairy cattle, with respect to their health, when they come into the state.

We are, therefore, very much interested not only in what is going to be done in other states, with respect to the control of Bang's disease, but also greatly interested in regulations which other states may make governing the importation of cattle with respect to Bang's disease into their states.
I just merely want to assure you, in closing, that New Mexico stands ready to do her share in cleaning up this disease in the state. Thus far the response from the cattlemen in the state of New Mexico has been very remarkable.

Dr. Wight: New York, Dr. J. G. Wills.

New York

Dr. Wills: Mr. Chairman, the first work on Bang's disease was done in New York about ten years ago, on the institution herds. For a period after that, there was no very active work. The state, however, in 1932, adopted a state plan. We call it a recorded and approved herd plan, the approved herd being one that has passed three consecutive tests within the period of a year or approximately so, and the owner of which has signed a very general agreement to be careful in adding to his herd and careful in respect to annual testing. We in New York have standardized the antigen. All the laboratories recognized in the state as official laboratories use an antigen prepared at the New York State Veterinary College. We believe that we have eliminated much of the objection that formerly existed with respect to different results in different laboratories. We have three state laboratories, and, in addition, in the state plan, we accept the tests of twelve others that are located in various parts of the state, that have been set up by veterinarians as part of their practice. Those laboratories are subject to inspection by the Veterinary College technicians at any and all times. They use the identical technic that is used at the College, and they use the antigen, of course, that the College prepares.

Under the state plan the test had to be made at the owner's expense, the state having no appropriation to pay for the cost of the veterinary service or for the cost of the test.

I might say that, in our state, the cost per sample has been generally fixed at 20 cents, a rather arbitrary figure, but that has been the system that has been followed. We do not recognize the rapid method, the tube method being the only official test that is recognized in New York.

We have at the present time 104 approved herds with some 200 more that are under the recorded plan; that is, they are under state supervision. Our percentage of reactors as near as we can figure it, lies somewhere between 18 and 20 per cent.

I might say that we have been testing in New York State from 50,000 to 60,000 or 70,000 cattle for some years. Most of them, of course, were private tests, and the State officially did not recognize them or make any attempt to record them or to take any action with respect to reactors. We have no regulations on disposal of reactors. We require reactors found in herds under state supervision to be sold only after the buyer has been notified that the animals are reactors. We follow no quarantine plan. We follow no permit plan.

I might say that we have been seriously considering the question of compulsory reporting of blood-tests. As yet no action has been taken.

Under the federal plan which New York has signed, we have not made very many tests as yet. As has been mentioned here before, the tuberculosis eradication program has been occupying so much of the time of Dr. Mohler's men and of the state men that they have not really gotten started on the blood-testing until very recently.

We have tried, in developing the Federal blood-testing plan, so to adjust ourselves as to go on with a state plan after the federal plan is discontinued.

I want to say here that Dr. Mohler, Dr. Wight and the organization in Washington have been very kind to us, have allowed us to modify their program in certain minor respects so as to conform to our state
plan, so that we hope to be able to go on, without any break whatever, when and if the government discontinues its program.

There has been something of a drop in the number of inquiries from our people, that is under the state plan, because of the rumors that are very general in New York, that the state will provide an indemnity for Bang's disease reactors in the near future. Whether they will or not is somewhat of a question.

I might say in our budget request for the coming session, the bill has been so drawn that a part of the money may be available for Bang's disease work; in other words, instead of being exclusively for tuberculosis, it is worded "for animal disease control." If the bill is passed as it has been drafted, it will give us an opportunity to use that money in other ways than has been possible in the past.

With respect to regulations, I, like Dr. Cotton and some of the others who have spoken here, have been more or less intimately associated with efforts to regulate the shipment of animals between the states for the past 25 or 28 years. I know we have spent a great deal of time in those years trying to get uniform regulations. I hope it will be possible to do it with respect to Bang's disease.

New York has, upon the request of the breeders, who, it seems to me, should have a considerable voice in these things, adopted a rather stringent regulation. In fact, I think most of you probably think we are out in front of most of you on that particular point, but we feel that it was necessary. Our breeders and cattle-owners seem to be almost unanimously in favor of continuing it. It is up to them, largely, as to whether uniform regulations are adopted, or whether it is possible to develop a set of regulations that will meet the needs of the various states. Personally, I am somewhat skeptical at that being possible, with the varying conditions that we have to meet from the Atlantic to the Pacific. I don't see how you are going to get a uniform regulation that will begin to suit the majority of our state officials or the cattlemen and cattle-owners whom they represent.

Dr. Wight: North Carolina. Dr. Wm. Moore is not here. North Dakota, Dr. T. O. Brandenburg. (Absent.) Ohio. I see Dr. D. C. Hyde.

Ohio

Dr. Hyde: Mr. Chairman, I might say that down in Ohio we have a plan that was inaugurated about 1928 that is almost identical with the working of the present federal agreement, with the possible exception that we did not pay indemnity on reactors, and the blood samples were drawn at the owner's expense through an accredited veterinarian. This veterinarian had received training at our state laboratory.

I might also mention that this was a voluntary plan, that herds were able to get under the plan where the owners were at the end of the rope. They had Bang's disease and they could no longer operate at a profit. They came to us for assistance. Up to the time we went into cooperation with the Bureau, we had succeeded in having about 300 herds accredited and, in addition to that number, we had about 300 additional herds that had one or more clean tests, that were not accredited. In addition to those, we had about 400 herds that had not reached the point of a clean test.

In Ohio we used the tube test only. I am glad to say that we had an opportunity to go along with the Bureau in the new contract. We started in a small way in August. We had 135 herds, representing about 2,300 cattle. In September we had 733 herds, representing 12,053 cattle; October 1,803 herds, representing 25,000 cattle. The first three weeks of November, 2,307 herds, representing 28,378 cattle, making a total, up to that time, of approximately 4,978 herds, representing 67,277 cows, with 9,830 reactors removed.
At the time of leaving the office yesterday (our figures are not very accurate at this time) we had between 7,000 and 8,000 applications on file, which represent about 100,000 cattle.

We are quite optimistic as to the future of this work. We know we only have a few herds represented. We have 245,000 dairy and breeding herds in Ohio, representing about 2,000,000 cattle. We were somewhat pessimistic when the Bureau stepped in and inaugurated the area plan for bovine tuberculosis, but we started it, and we finished. We were accredited on January 1, 1932.

We are of the opinion that, since the Bureau has taken over this important work, they will finish the job. We feel that, while we have only started, a few years hence this job is going to be finished. While Ohio is an exporting state, gentlemen, we are in favor of uniform regulations. Ohio does not care to ship any diseased cattle to your state. We would be glad to be checked on it. If there are any irregularities, we want to know, because it is our desire to furnish you only with clean cattle. We assure you we will do everything possible to that end.

I do not know what else I might say, except that Ohio is heartily in favor of this program. We have even gone as far as to tell the Bureau to write their own ticket, and we will vote with them. We are going to continue on with that program.

Our percentage of infection in Bang's disease, as near as we can determine, is probably from 15 to 18 per cent. It has been higher than that up to this time, but I do not believe that that is a fair index of what the average of the state is, for the reason that a great number of the herds that we have had an opportunity to survey are herds where the owner held back, with the idea that he would receive indemnity some time in the near future.

I might also say, in closing, that we have in our budget, which will be presented to our next session of the legislature, in January, a nice, sizable sum of money to compensate owners who are unfortunate enough to have Bang's disease in their herds. I believe that if our owners are insistent enough they are going to get it, because we have a great number of very influential cattlemen in both branches of the legislature at all times, and with their support we feel some time in the near future we will be able to get money to pay indemnities on reactors to Bang's disease, as we have in the past for bovine tuberculosis.

I might say that even the small state of Ohio has received $1,000,000 annually for the payment of tuberculin reactors.

Dr. Wight: Is there anyone here from Oregon? (No.) They are making great strides in Oregon. The next is Pennsylvania. Is Dr. T. E. Munce here? If not, we would like to hear from Dr. M. F. Barnes.

Pennsylvania

Dr. Barnes: Mr. Chairman, I think Dr. Munce could tell you about Pennsylvania a whole lot better than I can. I am not familiar with the latest figures. I might say, however, that Pennsylvania started with a definite plan in 1920 and has been operating under the plan ever since that time. I think we had approximately 1,000 herds which were certified as Bang's disease-free previous to the time of the cooperative plan. We had tested approximately 7,000 herds; I do not know the number of cattle. We were rather slow in starting the cooperative plan. The Pennsylvania breeders are not signing up as fast as they have in some other states, except in the northwestern part of the state, where they are in the selling counties. They have in those counties attempted to sign up the cattle-owners on the area basis. I see that Dr. J. B. Reidy is in the room. He has a copy of the data
covering the work that has been done up to the present time. I be-
lieve he can give that to you.

I might say, before closing, that we use the tube test, and all the
testing is done in a central laboratory.

Dr. Remy: Up to the present time we have tested 22,000 head of
cattle, and we have found 15 per cent of the herds were affected.

Dr. Wight: Rhode Island.

President Robinson: Is anyone here from Rhode Island? I notice
our inspector-in-charge, Dr. E. A. Crossman, is here. He knows all
about this. He leaves Boston at noon, comes over and looks at all our
cattle, and takes the six o'clock train home. Dr. Crossman, will you
tell about Rhode Island?

Rhode Island

Dr. Crossman: I don't know why Dr. Robinson called on me unless
it is that he is modest. Certainly, he has nothing to be ashamed of in
the little state of Rhode Island. They have a very good plan down
there that they are working on. I think they have a dozen accredited
herds. We have signed up, under this federal plan, something over
1,000 cattle in the last few weeks, without pushing it at all. That was
purely voluntary. I might say that is more cattle than we were
able to sign up by publicity and fighting in twelve months or more
on tuberculosis. We have no fear that this thing is not going over.

I was amazed to hear Dr. Cotton say that the farmers of Minnesota
were skeptical about signing a contract with the Secretary of Agricul-
ture. Down East, where we haven't raised all the money to pay for the
cattle in Montana, the farmers are very glad to sign this contract.
They still have faith in the administration and in the Secretary. I
think when we get ready to push this thing it will go just about as fast
as we want it to, because the dairymen there are used to dealing in
big numbers. We have just taken about 60 per cent of the cattle pop-
ulation in Massachusetts for tuberculosis, 125,000 out of 200,000. So
far in the preliminary work that we have done in Bang's disease, re-
actors run less than 15 per cent. So that does not frighten me at all.

Dr. Wight: South Dakota. Dr. C. H. Hays will say a word about
that state.

South Dakota

Dr. Hays: South Dakota, until this plan was inaugurated by the
federal government, had no plan on Bang's disease, but with this they
signed the memorandum and are willing to go ahead on this program.
It is fortunate that this program came in with the support it did fi-
ancially, because it has made possible the opening up of the tuber-
culosis eradication program. That is our paramount object at the
present time. South Dakota does have a law on its books regarding
the importation of cattle. They must be tested for abortion disease.
Your good wishes and perhaps your prayers have brought about the
possibility of South Dakota going ahead on the tuberculosis program
and also on the abortion program. We want you to pray for rain.

Dr. Wight: Tennessee, Dr. A. C. Topmiller.

Tennessee

Dr. Topmiller: Tennessee would like to see a standard antigen. It
would also like to see a uniform test. We think that all blood drawn
should be tested at the laboratory. We also would like to receive more
financial aid from the federal government for retesting.

Dr. Wight: The Texas state veterinarian isn't here, but I see a
Texan present, Dr. H. L. Darby.
Dr. Darby: Inasmuch as the state of Texas is ably represented by an official of the Live Stock Sanitary Commission, I feel Dr. J. J. Reid should be given an opportunity to discuss his own state.

Texas

Dr. Reid: Mr. Chairman, Texas has had, since 1926, a program for the eradication of contagious abortion, operating directly in cooperation with the owner, in which all of the testing was done in the state laboratory, the blood being collected by the owner's veterinarian. We have been able through this plan to accredit quite a number of herds. However, we are very eager and anxious to accept at this time the financial aid of the federal government to further the work.

All of the blood samples that are collected are shipped to a central laboratory and are tested there. We have to date tested 10,000 head, in which approximately 30 per cent are reactors. However, that is not a fair representation of our infection, as the herds we have already tested are herds in which infection was known to exist. Naturally, as our program goes forward, the number of reactors or the percentage of infection will be reduced.

I regret to admit that in Texas we have quite a good deal of contagious abortion in our range herds. We have animals in Texas as wild as jack rabbits but they stop long enough somewhere so that some are infected with Bang's disease. If the federal government will just stay with us, we will get the job done. It may take a little time to do it.

Dr. Wight: I am quite sure Utah isn't represented and neither is Vermont. I would like to say in passing that Washington is doing a vast amount of work with Bang's disease.

West Virginia. Dr. H. M. Newton is here.

West Virginia

Dr. Newton: There isn't very much to be said about conditions there for they are very similar to those of our neighboring states, particularly Ohio and Virginia. The plans have been discussed by representatives of those states.

We have been on a state plan in West Virginia for about five years, during which time we have accumulated a number of accredited herds on a plan similar to the accredited herd plan in tuberculosis eradication. There has been considerable testing done in the state, other than in herds under supervision for accreditation. In a way, that has been more or less detrimental to our interests down there, in that there has been no supervised method of disposing of or handling reactors. A considerable number of those reactors, of course, have found their way into other herds, many of which probably were clean at the time. So I feel in some ways our testing has not lessened the incidence of disease but has increased it. That, however, is being taken care of at this time, by a regulation that has been put into effect recently requiring that all reactors, regardless of the purpose for which they were tested or by whom they were tested, must be tagged and branded and reported to the Department. Of course, that has eliminated quite a bit of testing other than that being done under supervision.

We have been on the cooperative plan since about the middle of July and during that time have tested something like 2,500 cattle with about 12 per cent of infection, probably not that high.

We are encountering some difficulties, the chief one of which is the matter of replacements. The supply of cattle eligible to enter herds under supervision is limited, and the increase in prices during the last few months has made it difficult for owners to replace their cattle with anything like the indemnity and salvage they get out of their reactors. So that has been one of our difficulties.
We hear considerable about a milk shortage down there. I don't know whether that is true. I think the milk shortage is probably due to improper feeding. As a matter of fact, some of the representatives of the dairy association down there have been going out and discouraging farmers, herd-owners, from testing, due to the fact they say they are facing a milk shortage. That has also been a difficulty.

We are doing all of our testing, of course, in the laboratory. The plan is to take it county by county as much as possible; in the first place, to send the veterinarian into the county to hold meetings in connection with some of the local organizations, association of farm bureau, and get as many herds signed up as possible before we go and send a force in there, to clean up that county as soon as possible.

We are not particularly worried about our antigen. We have been furnished a strain of organism for the manufacture of our antigen, and every once in a while we send a sample to be tested and for approval.

It is doubtful as to what the future of the program is going to be. I am also doubtful as to the ability of the Department to secure indemnity funds, so I think we will have to depend on the present cooperative plan for the future of the work, until the money is exhausted.

**Dr. Wight:** Dr. H. D. Port from Wyoming.

**Wyoming**

**Dr. Port:** Wyoming has a plan for abortion, and has had it for the past year and one-half, adopted by our Live Stock Sanitary Board in Wyoming. We have done a limited amount of work in the state. Due to the drouth conditions, we have not attempted to operate under the funds appropriated under the Jones-Connally Bill. As soon as the drouth work is out of the way and the stockmen are in position to consider it, we propose to go on with the work. That is about all we have to report.

**Dr. Wight:** Gentlemen, in closing this part of the meeting I wish to say you certainly have been patient, but I think it has been very worth while, especially when you realize that 75 per cent of all the states have spoken here this afternoon. It is a wonderful cross-section of the situation to all of us who have had an opportunity to listen.

**President Robinson:** Is there any further business to come before this session?

**Dr. Fitch:** I move that the report of the Committee on Bang's disease be referred to the Executive Committee.

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

**President Robinson:** If there is no further business we will stand adjourned until 9:30 tomorrow morning.

... The meeting adjourned at 6:15 p.m. ...

**Recess**

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**THURSDAY MORNING, DECEMBER 6, 1934**

The third session convened at 10 a.m., President Robinson presiding.

**President Robinson:** Gentlemen, will you kindly come to order. This session is devoted to Meat and Milk Hygiene. We are very fortunate in having with us, Dr. Paul B. Brooks, Deputy State Commissioner of Health, Albany, New York, who will speak to you on "Some Observations on Milk-Borne Infection." (Applause.)

... Dr. Brooks read his paper. ... (Applause.)
SOME OBSERVATIONS ON MILK-BORNE INFECTION

By Paul B. Brooks, Albany, N. Y.
Deputy State Commissioner of Health

For some years now, as a sort of a side line to a busy job in general health administration, I have been interested in observing and studying milk-borne infection, particularly as it has been occurring in my own state, my interest being primarily in the administrative aspects of the situation. More recently, with our experience at home in mind, I have been interested in examining the records of milk-borne infection throughout the United States, as published in the United States Public Health Service Reports. While these records, as the only ones available covering the country as a whole, are most valuable, I have been led to the conclusion that they are incomplete and therefore by no means an accurate record of the milk-borne infection actually occurring. I am sure officials of the Public Health Service would be the first to admit this. If it be true, it is no fault of theirs but is the result of local failure to recognize and report incidents of infection.

In this discussion I am going to mention some of the observations we have made at home that I think may interest you and also try to explain why I believe the available records of milk-borne infection are incomplete and, therefore, if this is not generally recognized, misleading. My discussion will be limited to two infections commonly transmitted from cattle to men through milk, i. e., undulant fever and septic sore throat.

Last year, in New York State, 255 cases of undulant fever were reported, eight in New York City, with more than half the population, and 247 in the rest of the state—"up-state," as we say there. It is our practice in the department to make individual investigations of all cases reported, through our own medical field staff and the local health officers. Without attempting to go into the figures I can say that in a very large majority—nearly all—of the cases the infections apparently have been due to the use of raw milk from herds infected with Bang's disease. This means that the milk has been used and other possible sources of infection ruled out with reasonable certainty. We recognize, of course, that this is not absolute proof, but the probabilities are so evident as to leave little doubt in our minds. The wide discrepancy just mentioned in the numbers of cases in New York City and the rest of the state (8 last year in the city and 247 in the rest of the state) seems to support the con-
clusion, since in New York City all milk is pasteurized, except a very small amount of "certified," while in the rest of the state, according to the latest figures we have, only about 50 per cent is pasteurized. Dr. HcCoy, of the Hygienic Laboratory, in 1931, estimated that about half the cases reported in the United States were traceable to raw milk. In the same general connection, I understand that our laboratory, in nearly all of the cases in which it has made bacteriological studies, has found organisms of the bovine type.

With reference to the proportion of pasteurized milk in the state, outside of New York City, I am sure if a survey can be made a few months from now we will be able to report a much higher proportion of pasteurized milk than our previous figures indicate. As a result of an amendment made to our State Sanitary Code about a year ago, after January 1 no raw milk other than "certified" and a new high grade called "Special A Raw" may be sold in any city or incorporated village with a population of 15,000 or over. This new grade must be from herds free from mastitis and abortion. A large number of raw-milk dealers, rather than undertake to meet the high standards, have either started pasteurizing or intend to do so on January 1. Also several cities have "taken the bull by the horns" and gone further, enacting local ordinances permitting after January 1 no raw milk other than "certified." One of these has at least 50 per cent raw milk and, about four years ago, had the most extensive and serious milk-borne epidemic of septic sore throat we have had in the state. At that time an attempt was made to put through a pasteurization ordinance but the opposition of the raw-milk dealers defeated it.

To return to undulant fever: in 1933 the Public Health Service reports recorded 1,659 cases as having been reported in the United States. This and similar figures have often been cited by proponents of raw milk as evidence that the incidence of undulant fever is insignificant from a public health standpoint. I certainly would not contend that it is a major public health problem, although I have seen several prominent citizens convinced that it was, as a result of having an attack of the disease. It certainly is a disease that no one, who has once had it, wants to have a second time. I do believe, however, that the cases reported represent only a fraction of those actually existing. In my own state the number reported in 1927 was 21. It has increased each year since and the figure for 1934 will be greater than the one (255) that I have cited for 1933. We do not believe this means an increase in the number of cases but rather increasing recognition of the disease by physicians.
According to Public Health Service Reports for the period 1927-1931, inclusive, only 18 states reported cases in 1927 and, in 1931, 47 (including the District of Columbia). In all of the states where it would appear, from scanning the reports, that the disease is taken seriously, the numbers of reported cases apparently have been increasing from year to year. Ohio, for example, reported one in 1927 and 115 in 1931; Wisconsin one in 1927, 162 in 1931; Illinois five in 1927, 124 in 1931. Some of our neighboring eastern states, notwithstanding the facts that their geographic and climatic conditions and their cows are the same as New York's and there are no germproof fences on our boundary lines, if the record is to be accepted at its face value, are much more fortunate in escaping infection than we are in New York.

On the face of the record the same thing would seem to be true with reference to milk-borne outbreaks of septic sore throat. According to the reports for 1927 to 1931, inclusive, only Massachusetts, in that period, approached New York in the number of outbreaks. While we were recording eleven and Massachusetts six, our neighbors, Pennsylvania and New Jersey, were recording one and none respectively. This same disproportion in the record has existed over a much longer period than the one of five years I have been citing. I can conclude only that either they have been remarkably fortunate or that they have missed something.

Looking back over eleven years, nearly all of our more recent outbreaks and some of the earlier ones have been traced with reasonable certainty to cows with mastitis. For obvious reasons it is not always easy to find the cows, but our more recent experience has convinced us that in almost any extensive outbreak—one for example with 25 or more cases—they should be found. Occasionally we have been able to find the human carriers who apparently infected the cows. While we believe they always are or have been there, naturally it is not always easy to find them. In some, the carrier condition probably had cleared up before we got around to take cultures. In one interesting case the proprietor of the dairy had a wound on his forearm discharging hemolytic streptococci. He and the cow were responsible for an outbreak of about 50 cases. Incidentally, the milk from this dairy was said to have had an average bacteria count around 4,000 and it is interesting to note that some of our most serious epidemics of this and other diseases have been traced to milk of exceptional quality, coming from exceptionally well equipped and managed farms.
A brief reference to the septic sore throat epidemic previously mentioned as our most serious and extensive, will serve to bring out some characteristics and difficulties common to many of these epidemics. This was an epidemic of around 600 cases. It was traced to one of the best farms delivering to the city and, eventually, to what was said to be the most valuable cow on the farm. Although the proprietor of the dairy did not deny responsibility and seemed thoroughly cooperative, the cow was not found until some time after the epidemic. Then the proprietor saw a chart on which the daily incidence of cases was plotted. He noticed that the epidemic reached its peak on a certain date and then abruptly subsided. He then recalled, apparently for the first time, that at about that time he had "dried off" and turned out a cow with an injured udder. She was "it." The history of this cow was that she had torn her udder and one teat on a barbed-wire fence. The owner had boiled a needle and thread and sutured the wound. Later, when it became inflamed, she had been dried off and turned out. At the time of examination the injured quarter was still discharging watery pus. Hemolytic streptococci of the human type, corresponding to those in the human cases, were found in a quarter other than the one originally and most seriously infected. The same organisms had been found in the throat of the dairyman and the assumption is that he infected the cow.

Our experience with milk-borne septic sore throat epidemics, in addition to confirming our previous belief that most septic sore throat epidemics are traceable to milk, has led us to two rather definite conclusions. One is that in any extensive milk-borne outbreak extending over several days we should not be satisfied until we have found the cow. A carrier may contaminate a pail or can of milk but he is very unlikely to do it repeatedly. In the infected udder the organisms multiply rapidly and are likely to be discharged into the milk in large numbers for at least several days. The other is that a cow with mastitis is responsible for an outbreak only when infected by a person who is harboring virulent hemolytic streptococci, most often following an attack of septic sore throat, perhaps mild. I might add a third fairly definite conclusion, i.e., that the organisms need not necessarily be of the type which Professor Frost has called the *Streptococcus epidemicus* and which I believe he still considers essential to a diagnosis of septic sore throat. The organisms quite clearly responsible for several of our epidemics have not met the epidemicus specifications while, on the other hand, organisms meeting the epidemicus specifications, includ-
ing the capsule, have been found in cases of scarlet fever and
errysipelas and in normal throats.

Turning again, finally, to the question of the record of inci-
dence of milk-borne septic sore throat in the United States,
there is food for thought in even a superficial examination of
the records of deaths from this disease and of all reported cases,
whether or not milk-borne, and in a comparison of these with
the record of milk-borne epidemics. I will consider, again, only
the five-year period previously used—1927-1931.

In this period cases or deaths or both were reported from all
states excepting Mississippi and New Jersey, indicating that
the disease occurs everywhere. Twenty-seven milk-borne out-
breaks were reported by ten states. Twenty were credited to New
York, Massachusetts and Ohio (11, 6 and 3), seven other states
reporting one each. Thirty-eight states recorded none.

Among the states recording no outbreaks was Texas, which
reported 509 deaths. Apparenty reporting of cases is not re-
quired there. If we take as the probable case fatality the highest
percentage I noted in the milk-borne epidemics, 3 to 4 per cent
(3 to 4 deaths per hundred cases) Texas should have had about
13,000 cases. Illinois, with 195 deaths, should have had about
5,000 cases; Indiana, with 672 deaths, 1,700 cases. If it is
true that septic sore throat is more often than otherwise milk-
borne, it seems remarkable that they should have escaped milk-
borne outbreaks. I mention them only because the numbers are
large. Michigan reported 255 deaths in 1927; 274 in 1929, none
in the other three years; Virginia, 112 in 1928, none in the other
four years; Tennessee, 73 in 1927, none in the other 4 years.
Recalling that every death probably means at least 25 cases, one
ordinarily would not expect such wide variations in the absence
of epidemics.

In our own state, we are reasonably well organized for the
discovery and investigation of epidemics. We have experienced
medical officers (district state health officers) scattered over
the state in 15 districts and 950 local health officers who are
physicians. Reports of cases by physicians go through the
health officers to our district officers. Health officers also are
required to report any unusual prevalence of febrile illness
with sore throat. We are continually "harping" on being on the
lookout for outbreaks and catching them early. Yet we believe
we have completely missed epidemics. There were twelve years
in which only two outbreaks were recorded, while in the suc-
ceding six years we have averaged two and a fraction yearly.
THE PRESENT STATUS OF MILK CONTROL IN THE UNITED STATES

By LESLIE C. FRANK, Washington, D. C.
Sanitary Engineer in Charge, Office of Milk Investigations
U. S. Public Health Service

In order to present in a short paper the clearest possible picture of the status of milk control in the United States, brief answers are herewith given to a number of fundamental questions.

(1) What is the history of milk-borne disease in the United States?

In 1927, Armstrong and Parran listed 791 American outbreaks of milk-borne disease as having been reported in the literature.
from January 1, 1881, to January 1, 1927. This represents approximately 17 outbreaks per year for the 46-year period.

However, the number of outbreaks of milk-borne disease occurring in the United States has been and is much greater than this, since the above figures do not include any outbreaks which failed to find their way into the literature.

Since 1924, the Public Health Service has been sending annual questionnaires to all state health officers and to all city health officers of cities over 10,000 population. As a result of these surveys outbreaks have been reported for the years 1924 to 1933, inclusive, as shown in table I.

**Table I—Milk-borne outbreaks reported by state and city health officers in the United States for the years 1924-1933, inclusive.**

<table>
<thead>
<tr>
<th>Disease</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhoid</td>
<td>28</td>
<td>34</td>
<td>49</td>
<td>196</td>
<td>28</td>
<td>27</td>
<td>21</td>
<td>23</td>
<td>25</td>
<td></td>
<td>286</td>
</tr>
<tr>
<td>Paratyphoid A</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Paratyphoid B</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Septic sore throat</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>51</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>44</td>
<td>44</td>
<td>68</td>
<td>36</td>
<td>50</td>
<td>44</td>
<td>34</td>
<td>33</td>
<td>42</td>
<td></td>
<td>436</td>
</tr>
</tbody>
</table>

*Note:* The average number of outbreaks reported per year during the above 10-year period is approximately 43.

In addition to the outbreaks shown in table I, it is believed that there occur many outbreaks which are actually milk-borne but which are not recognized as such.

It should be noted that the above discussion does not include reference to the milk-borne diseases which do not usually occur in the form of outbreaks, namely tuberculosis, undulant fever, and the intestinal disturbances of children.

With reference to milk-borne tuberculosis, it is generally agreed that cases of tuberculosis other than respiratory, such as glandular, bone, and abdominal, are to a large extent of bovine origin. Table II gives the death-rates per 100,000 population in the United States from non-pulmonary tuberculosis from 1900 to 1932.

The figures, which were taken from the 1933 annual report of the National Live Stock Exchange, on the Eradication of Tuberculosis in Live Stock, by H. R. Smith, Live Stock Commissioner, are particularly striking because of the decrease shown in non-
TABLE II—Death-rate from non-pulmonary tuberculosis, 1900-1932.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TUBERCULOSIS OTHER THAN RESPIRATORY</th>
<th>YEAR</th>
<th>TUBERCULOSIS OTHER THAN RESPIRATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>21.4</td>
<td>1917</td>
<td>22.5</td>
</tr>
<tr>
<td>1901</td>
<td>22.4</td>
<td>1918</td>
<td>21.4</td>
</tr>
<tr>
<td>1902</td>
<td>21.9</td>
<td>1919</td>
<td>18.1</td>
</tr>
<tr>
<td>1903</td>
<td>23.6</td>
<td>1920</td>
<td>17.0</td>
</tr>
<tr>
<td>1904</td>
<td>24.5</td>
<td>1921</td>
<td>13.3</td>
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<tr>
<td>1905</td>
<td>25.6</td>
<td>1922</td>
<td>12.1</td>
</tr>
<tr>
<td>1906</td>
<td>24.6</td>
<td>1923</td>
<td>11.5</td>
</tr>
<tr>
<td>1907</td>
<td>24.2</td>
<td>1924</td>
<td>11.7</td>
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<tr>
<td>1908</td>
<td>23.6</td>
<td>1925</td>
<td>10.8</td>
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<tr>
<td>1909</td>
<td>23.4</td>
<td>1926</td>
<td>10.7</td>
</tr>
<tr>
<td>1910</td>
<td>24.3</td>
<td>1927</td>
<td>9.5</td>
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<tr>
<td>1911</td>
<td>26.5</td>
<td>1928</td>
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<td>1912</td>
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<td>24.8</td>
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<td>1915</td>
<td>22.8</td>
<td>1932</td>
<td>6.5</td>
</tr>
<tr>
<td>1916</td>
<td>22.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pulmonary tuberculosis since 1917, at which time the serious work upon the elimination of reactors from cattle was begun. The concurrent increase in the use of the pasteurization process should, of course, not be ignored.

(2) What progress has been made in reducing the incidence of tuberculosis in dairy cattle?

As above stated, the history of serious tuberculin-testing of cattle in the United States dates from about 1917. A report of the Bureau of Animal Industry of the U. S. Department of Agriculture for November 1, 1933, shows that the number of cattle tested per year in the United States has steadily increased from about 20,000 in 1917 to about 13,000,000 in 1933. The effect of this work is shown by the fact that the average percentage of cattle found to be tuberculous has dropped from 4.0, in 1922, to 1.4, in 1932.

We may study the extent of tuberculin testing in another manner, namely by determining the percentage of milk sold in American municipalities which is derived from tested cattle.

In 1932, the U. S. Public Health Service issued a report* which was based upon surveys made in 1927 and 1931 and showed that the percentage of milk from tested cows in American cities of 10,000 or more population has increased from 68.1, in 1927, to 88.7, in 1931. It seems quite reasonable to believe, therefore,

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*The Extent of Pasteurization and Tuberculin Testing in American Cities of 10,000 Population and Over in 1927 and 1931, by L. C. Frank and F. J. Moss (Mimeographed publication of the U. S. Public Health Service).
that within the next five or ten years the percentage of milk from tested cows sold in American cities will be well above 95.

(3) What progress has been made in increasing the percentage of milk pasteurized?

This question is fundamentally important because tuberculin testing can be expected to have no effect upon milk-borne diseases other than tuberculosis, such as typhoid fever, diphtheria, scarlet fever, septic sore throat, and undulant fever. The most effective single weapon against such milk-borne diseases is, of course, pasteurization.

In 1900, the percentage of milk pasteurized in the United States was insignificant, but since that time an enormous improvement has taken place. The above-mentioned study shows that in 1927 the percentage of milk pasteurized in American cities of 10,000 population and over was 81.8, and that this figure had increased to 87.5 by 1931. It is therefore reasonable to believe that, within the next ten years, over 95 per cent of milk sold in American municipalities of 10,000 population and over will be pasteurized.

It should be noted, however, that in the smaller municipalities of the United States a considerable percentage of milk is still sold in the raw state. Thus, in 1931, 41.4 per cent of the milk sold in cities of 10,000 to 25,000 population was being sold in the raw state. On the other hand, in cities of 500,000 population and over 97.9 per cent of the milk was found to be pasteurized.

(4) What progress has been made in securing the adoption of uniform effective milk legislation in the United States?

Until the year 1923, very little progress had been made. Several states had begun to see the importance of uniform legislation and were urging their municipalities to adopt various types of model milk ordinances, but considering the United States as a whole but little had been accomplished.

The advantages of a standard procedure are clear. Local milk control officials who use a standard milk control method can use directly the accumulated enforcement experience of all other officials who require the same standard. The courts will find it easier to render fair decisions when violations are brought before them, since they, too, will be able to take advantage of the legal decisions connected with the same legislation elsewhere. Competition between various groups of the dairy industry will be placed upon a fairer basis since all groups will be subject to the same sanitation requirements. Again, uniform specifica-
tions should tend to decrease the cost of dairy equipment to the industry. Finally, uniform specifications uniformly applied should increase the confidence of the milk consumer in milk quality and hence encourage optimum consumption.

For all of these reasons, and because the chaotic condition of milk legislation and its enforcement was undoubtedly responsible for the large number of milk-borne outbreaks of disease discussed earlier in this paper, the U. S. Public Health Service undertook in 1923 to devise a program which would gradually bring about the voluntary local adoption and enforcement of uniform milk sanitation legislation. The principles upon which the Public Health Service program is based are briefly described as follows:

(a) All milk legislation, irrespective of type, should define a grade of milk which combines the maximum safety and flavor with the minimum cost.

In the uniform milk ordinance recommended by the U. S. Public Health Service and the U. S. Department of Agriculture, such milk is defined under the grade label "Grade A Pasteurized." Care has been taken to surround this grade of milk with all practicable safeguards both at the farm and at the pasteurization plant. Maximum safety is secured through the process of pasteurization. Maximum flavor is secured through cleanliness and cooling requirements, and minimum cost is assured by avoiding all specifications which have no significant public health value.

(b) Since it is at present inadvisable in many American communities to require the compulsory pasteurization of all milk, a uniformly practicable milk ordinance must also define a grade of raw milk which is as safe as raw milk can practicably be made.

Two grades of such milk are defined in most American milk ordinances and have therefore been incorporated in the nationally recommended standard. They are certified milk, which is supervised by local medical milk commissions, and Grade A raw milk, which is supervised by the local health department.

The Public Health Service emphasizes in its publications, however, that all milk should be pasteurized or boiled before it is consumed, and that people who cannot secure pasteurized milk or prefer to buy raw milk should pasteurize or boil the milk at home.

(c) All milk legislation should provide the health officer with the most powerful available enforcement devices.
Two such devices are available. First, the ordinance may require all producers and distributors of milk to hold health department permits for the sale of milk which may be revoked when violations are discovered. Second, the ordinance may define lower as well as upper grades of milk and require all milk distributors to label their milk supplies with lower grade labels when upward grade requirements are found to have been violated.

The milk ordinance recommended by the federal government includes both of these enforcement devices, that is, it empowers the health officer to require a milk distributor to display a lower grade label when Grade A requirements are found to have been violated, and further empowers him to revoke outright the permit to sell milk if defects are not corrected within a reasonable period of time. In addition, when emergencies arise permits may be summarily revoked.

It should be noted, however, that the great majority of health officers are reluctant to revoke the permit immediately when violations occur, and there is always the danger that the courts will not sustain such a punishment unless the offense is extreme. Although there is also some reluctance to degrade when violations occur, this is not nearly so frequent and for this reason the degrading device has been made an optional but a highly recommended part of the Public Health Service Milk Ordinance, in addition to the permit revocation device.

(d) Dairy farms and milk plants should be inspected and milk samples tested with sufficient frequency to insure strict enforcement of the ordinance.

In order to satisfy this requirement the milk ordinance recommended by the Public Health Service specifies how often the health department shall inspect dairy farms and milk plants and test milk samples. This represents a radical departure from most earlier types of milk ordinances, and is considered of vital importance. If such requirements are not included in a milk ordinance, experience has indicated that enforcement is usually lax, particularly at the dairy farms supplying pasteurization plants.

(e) In order to insure uniform enforcement of the various items of the milk ordinance the items should be interpreted in accordance with a standard handbook or code.

Such a code has been prepared by the Public Health Service. It gives the public-health reason for each required item of sanitation and a detailed statement of what should be considered by the milk inspector as satisfactory compliance. This inter-
pretative handbook serves as a textbook for milk inspectors and members of the milk industry, and tends to prevent disputes between them.

(f) Ratings of the milk control work of all municipalities should be made from time to time by the state health department and checked by the U. S. Public Health Service. Semi-annual lists are published of the names of all municipalities which receive ratings of 90 per cent or over.

The object of this part of the American milk sanitation program is obviously to furnish consumers with a yardstick by which the performance of local authorities and the industry may be judged, and to furnish the traveling public with a milk-quality guide. In short, the object of this device is to promote and reward strict enforcement of the ordinance.

The total number of American municipalities which have adopted the U. S. Public Health Service milk sanitation program is nearly 600. Of these 106 have thus far attained municipal milk sanitation ratings of 90 per cent or more and have been included in the above mentioned lists of cities published semi-annually by the Public Health Service.

The above municipalities are located in over 30 of the 48 states, although the vast majority of them are in the southern half of the United States.

**SUMMARY**

The rapid progress being made in the United States toward the elimination of tuberculosis from dairy cattle, the increase in the pasteurization of milk, the adoption of uniform, effective milk ordinances by American municipalities, and in the development of a rating method for promoting the strict enforcement of such ordinances, justify the belief that within the next generation the United States of America will practically have eliminated milk-borne disease.

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**DR. E. T. FAULDER:** We have been very fortunate this morning in listening to two splendid, able, instructive and interesting addresses, by Dr. Paul B. Brooks and Dr. Leslie C. Frank. Therefore, I move that we give these two good men a rising vote of thanks and express the hope that they will pay us another visit in the future.

... The audience extended a rising vote of thanks to Drs. Brooks and Frank.

**PRESIDENT ROBINSON:** The next paper is "Meat and Milk Hygiene," by Dr. J. S. Koen, Veterinary Inspector, U. S. B. A. I., Baltimore, Maryland. I understand that Dr. Koen is not here, but Dr. A. F. Schalk, of Columbus, Ohio, will read the paper.

... Dr. Schalk read the paper prepared by Dr. Koen...
MEAT AND MILK HYGIENE

By J. S. Koen, Baltimore, Md.
U. S. Bureau of Animal Industry

The importance of meat and milk hygiene should be apparent to every member of the U. S. Live Stock Sanitary Association. Meat and milk products constitute the basis of food supply for every human being at some stage of life, and throughout life for a large majority. In connection with other food supplies and their relation to human health they occupy a position of paramount importance. The scope of consideration by this Committee should be enlarged to include other foodstuffs and the title changed to Committee on Food Hygiene.

The purpose of meat and milk hygiene is twofold:
1. That meat and milk products intended for human consumption are secured from healthy animals.
2. That these products be prepared and handled in a sanitary manner.

MEAT HYGIENE

The securing of meats from healthy animals and their preparation in a sanitary manner is accomplished by a system of meat inspection. My remarks will have reference to meat inspection in the United States, since I have no personal knowledge of such work in other countries. In this country, there are two systems in use: federal inspection under the direction of the U. S. Bureau of Animal Industry, and local inspection under the direction of states or municipalities. Federal meat inspection has jurisdiction over all meats intended for interstate or foreign trade, while local inspection covers meats intended for use locally or within a given state. Federal inspection has supervision over approximately 70 per cent of all meats sold in the United States and thus becomes largely a federal project. The U. S. Bureau of Animal Industry maintains the highest standard of meat inspection in the world. Its efficiency is secured and maintained by high qualifications of inspectors and insuring the conduct of their service free of political domination or interference.

Approximately 30 per cent of the meat supply of the nation is prepared under local inspection, or without inspection. It is to this supply that our association needs to direct its attention. Local meat inspection is generally under state or municipal jurisdiction. In either case, the appropriations for such work are usually inadequate to support a competent personnel and
the service suffers accordingly. Qualifications of local inspectors are frequently based on party regularity and how often the applicant has voted the straight party ticket. Too often the state or municipality undertakes the writing of compromise rules and regulations, or lacks authority to enforce rules patterned after those of the U. S. B. A. I. Under such conditions, the standard of inspection is lowered and a corresponding lack of protection afforded the public they pretend to serve. With each state or municipality writing its own rules and regulations, no uniformity of meat inspection can be established. We urge all states and municipalities to adopt and apply the federal rules and regulations in so far as they can be applied to local conditions. Also that qualifications of inspectors and freedom of official action be the same under local inspection service as for federal service. Any lowering of the federal inspection standard decreases the protection to the public and is a waste of funds that support it.

Because of their training and ability to recognize, diagnose and evaluate animal diseases as they are related to human health, veterinarians have always been placed in charge of federal meat inspection. The efficiency and economy of this policy should assure its adoption by all states and municipalities.

We believe the federal system could be improved by proper restrictions being enforced over meats prepared by farmers and permitted to be shipped interstate under certificates of exemption.

Milk Hygiene

To secure clean milk from healthy cows, to have it handled in a sanitary manner and delivered to the consumers a safe product is the purpose of milk hygiene. Any program that fails to accomplish that is unworthy of the support of this Association. I believe the following proposals will accomplish the entire purpose. I believe it will afford adequate and full protection to the public and insure prosperity to the milk industry.

No milk hygiene (milk control or milk inspection) is worthy the name that cannot certify to the healthfulness of the source of milk—the cow. To determine the health of producing cows requires physical examinations at frequent intervals. It also requires the administration of scientific tests for tuberculosis, mastitis, Bang's disease, and other animal diseases not readily recognized by physical examinations. These examinations and tests are professional and technical services. They demand training and experience that enables one to recognize and diagnose animal diseases. They are, therefore, essentially veterinary
services. It is not my intention to propose a scheme to promote veterinarians. However, I would be guilty of cowardice if I failed to emphasize the importance of this particular veterinary service in milk hygiene. It is the very foundation of milk control work. Unless we start right we can never hope to succeed with so important a task.

Clean milk means much more than simply having a milk supply free of dirt. After noting sediment tests of hundreds of samples of milk taken from the daily supply of one of our large cities, I must confess that securing a milk supply free of dirt and other filth is quite some undertaking. But that can be accomplished by observing the simplest forms of sanitation. To be really clean, milk must be free of all contaminating influences. To protect milk against dirt, bacterial growth, and disease contaminations requires professional training and knowledge of animal diseases and the proper use of sanitary measures to combat them. For this reason, I must again point out that veterinarians are best qualified to perform this type of service. Because of their special training they can perform a complete farm service in milk hygiene. This makes their employment an economic as well as a professional advantage.

After securing clean milk from healthy cows, the problem of milk hygiene is transferred from the farm to the milk plant. If the milk is to be delivered as raw milk, the control regulations should be the same as for certified milk. Any lower standard for raw milk would be little short of criminal.

Most milk is now pasteurized before being delivered to the consumers. Pasteurizing milk plants should be constructed along strictly sanitary building lines and should have approved equipment that will insure perfect pasteurization. The equipment should be checked with self-recording devices that will indicate the operations. All operations in connection with the milk plant should be double-checked by competent inspectors. The qualifications of these inspectors should be a sanitary engineer's degree or actual proven practical experience as a milk operator. Political inspectors should be barred from all milk hygiene work of any character whatsoever.

The cost of such a program is the main argument that will be advanced against it. The benefits to the public in adequate protection and the financial gains that would be certain for those in the milk industry make the cost insignificant. Competent authorities tell us that milk consumption in most of our large cities is only half what it should be normally. The reason for this must be that consumers of milk in these cities are not sat-
satisfied they can get the quality of milk their children should have. If they could know the milk supply was what it should be it is most logical to assume they would want their children to have all they need. Thus by assuring the public of the quality of their milk supply through an adequate system of milk hygiene, or milk control, the opportunity is presented to producers and distributors to increase the output of their product 100 per cent and still meet only a normal demand for milk. What other industry has such an opportunity? And what other industry would not be willing and anxious to spend much more than the cost of adequate milk control as I have indicated to increase their business 100 per cent? It is not overproduction that demoralizes the milk industry, threatens the dairy farmers with bankruptcy, and causes the distributor sleepless nights. It is underconsumption. The only cure for underconsumption is the creation of a larger demand. The surest way to increase demand for milk, in my opinion, is to insure the quality and wholesomeness of it. And the best way to bring about this insurance and to win the confidence of the milk-consuming public is the adoption of a strictly professional program of milk hygiene.

The difficulty in securing the adoption of such a program by cities at this time lies in the fact that milk control is largely a local project with each city and is under almost complete domination of local politicians. Many of these politicians think more of votes than they do of babies. The case is not hopeless, however. Health commissioners and other public officials, who are charged with public-health responsibilities, are seeking the support of mothers and other public-spirited citizens in an effort to remove public health service from political influence and domination. When this has been secured, and it will be secured, the task will be relatively an easy one.

Just as I suggested the U. S. Bureau of Animal Industry to lead the way for uniform meat inspection, so am I suggesting the U. S. Public Health Service to lead the way for uniform milk control. This latter agency has enlisted the support and aid of many of the ablest representatives of the milk industry in the formation of a Standard Milk Ordinance.

That definite progress may be attempted, I recommend that your Committee on Meat and Milk Hygiene be instructed:

1. To confer with officials of the U. S. Bureau of Animal Industry and undertake the formulation of uniform rules and regulations for meat inspection service that can and should be adopted by states and cities engaged in local meat inspection.
2. To confer with officials of the U. S. Public Health Service on the Standard Milk Ordinance and to recommend such modifications that in their judgment would encourage its adoption for uniform milk control work.

3. That the results of these conferences be reported to the next meeting of this Association.

DR. SCHALK: Mr. President, I want to take this opportunity to express, particularly, the appreciation of the Committee to these gentlemen of the medical profession, Dr. Brooks and Dr. Frank, who have come before us and given us their experiences and their views on this very, very important problem to the veterinary profession. We do not have the opportunity of having men of their experience appear before us very often. I would like to have you open this matter for a little further discussion. I am quite sure these gentlemen will be glad to attempt to answer any questions you feel inclined to ask.

(Applause.)

PRESIDENT RORISON: Gentlemen, the subject is now open for discussion.

DR. SCHALK: Dr. Frank, you have been in that service for quite a number of years, I believe. I should like to ask what you think of the progress that has been made, in a general way, in municipal milk control, whether it has made the progress that it should have made, or whether you think some special emphasis will make the progress more rapid.

DR. FRANK: It would hardly be proper to say that the progress which has been made is satisfactory and in the same breath for me to continue to report the number of milk-borne outbreaks that occur each year. The progress has been rapid, I will put it that way. From the standpoint of rate, I think you might term it satisfactory. I don't believe you meant whether we had reached the ultimate goal, did you?

DR. SCHALK: No.

DR. FRANK: I think the progress has been fairly satisfactory, but we are still quite far from the ultimate goal. Perhaps I could picture that quantitatively this way, that there are something like 2,000 to 2,500 municipalities in the United States that have good milk control work, but I doubt if more than 1,000 of them are doing what would be called good milk control work. Those 1,000 were not doing good milk control work in 1900.

DR. SCHALK: In the 2,000 you mentioned, what was the minimum population.

DR. FRANK: I am considering populations of, say, around 1,000 or 2,000 and up. When you get down below 1,000 population, it becomes troublesome to think of local milk control, and you then have to begin to think of either county or district milk control rather than city or municipal, as I understood you to speak of it.

DR. CARY: There are just a few words that I want to say about milk and meat inspection in this country. I think we have made wonderful progress in some of the higher-up places where it is handled in offices, where they get reports, records and things of that kind.

The other day I heard a man say that if milk, from the time it left the cow until it got to the consumer, was taken care of, that was the chief function of the milk inspector. You do not want to get away from this fact, the veterinarian especially, that we have got work to do
while the milk is in the cow. There is where we are lax, mostly, in the cities I have visited in this country and Europe. They do not look after the health of the cow. This is the veterinarian’s fault. It is done in a general way but not enough of it and not constantly enough. I have observed this in all countries I have visited: They like to get this in the laboratory and they like to get out and analyze and do a lot of that work, but we have got to get down and take care of the cow, the animal on the farm and see that that animal is all right, or they will not produce healthful milk. Who is to do that? The veterinarian.

Let me go back a little. Some of you heard me report on this subject some years ago. I went into one of the best states in the Union. I said to the head in that state, “What is the matter that you haven’t more veterinarians on your force?”

He said, “Well, they are not qualified.”

I said, “Why?”

He said, “They don’t know the details that they ought to know.”

I said, “What is the matter?”

“It is the fault of the schools that trained those men.”

The schools have got to do something, the veterinary colleges have to do more in milk and meat inspection work. You say I am critical. I am not critical. I am just telling you facts. You college men and you veterinarians have got to get up to the standard and do this work. If you don’t do it, who is going to do it? The trouble now is that there are too many men in milk and meat inspection who do not know about it, and some of them were never educated.

Gentlemen, the work on animals is the veterinarian’s business. If he doesn’t do it, the other men who are not qualified will do it. Even doctors are not qualified. I run up against them every once in a while, health officers of the cities, who talk about a lot of stuff but they don’t know it when they go out there to see it. How many of them can handle disease of the udder, not saying anything about other things? None of them. Not many of the veterinarians handle them very well. What we need is more individual inspection of the cow before she gives this milk on the farm or at the dairy. Who is to do that? The veterinarian. The dairy inspector cannot do it. All these other fellows they have in inspection cannot do it. I say we want to drive home this one thing and go after what belongs to the veterinarian.

Somebody said I am a crank because I work for the veterinarian. I have spent all my life in college work and field work, and I want to tell you that I am not talking theory to you. What is the matter with a lot of doctors and veterinarians? They are good on theory, but they aren’t worth a cuss on practicality. I can tell you that; I see it. What is the matter? They are not started off right in the colleges. Get back to the source of it; it is there.

That is the reason why the veterinarian in one state said, “I can’t employ veterinarians because they are not qualified.” I am just telling you this. If I didn’t run up against it, I wouldn’t tell it to you. We have got to remedy that, get right back to the college and remedy it. We need more of this kind of work.

I do not mean to say you can make every man who graduates from college a milk and meat inspector, but if he wants to take that you can give him special work and practical work.

Some of the schools have got to get some equipment. Some of them don’t do anything but theoretical work, lectures. The other day one fellow said, “I can tell him all about it but does he see it?” Put him out there at work and let him do something until he gets it and acquires it.

A little while ago I saw one of my boys who is a meat inspector down at the yards. He has been there about a year. I talked to him about
it and he said, "I want to tell you, you told me a lot and you did a lot for me, but I have learned more in the last year on meat than in the four years I took the course under you."

Dr. Brooks: May I consider myself a part of the audience to call attention to one thing. The figure Dr. Frank cited, 87 per cent pasteurized milk in cities over 10,000 population, in 1931, might be misunderstood unless we realize that in New York State that average is pulled up very materially by the very large places. When you get down into places around 10,000 to 30,000, you find most of them have a very much higher percentage of raw milk. We have some 16 or 17 of the smaller cities, out of 59 in all, that have or had, on our last figures, over 50 per cent raw milk. When you get down below that, into the rural areas, that is what spoils our average because in many of the large rural areas there is almost no pasteurized milk.

That being so with us, I thought when Leslie Frank predicted it wasn’t going to be long (I forget whether he specified any number of years) before we were going to be entirely rid of milk-borne epidemics, he was terribly optimistic.

Before I sit down I would like to agree with what Dr. Cary said about the doctors and also veterinarians. Doctors generally (and this applies to a good many health officers), just as Dr. Cary said, may know the theory thoroughly, they don’t always, but sometimes they think they do when they don’t, but when it comes to putting it into practice, getting out and applying it, as he said, they begin to fall down.

I happen to know, or at least I have been told that that applies to some of the veterinarians, when it comes to the question of handling abortion tests, which we are dealing with just now in trying to rid the herds of abortion. The veterinarians, from what they tell me (I have not been out and seen this for myself) know all about the test and what it means and how to interpret it, but when it comes to the administrative end of it, segregating the cattle and telling the dairymen how to do it and identifying the cattle and having the records in shape so somebody else can come along and tell what has been done, a good many of them, they tell me, fail down. That is something we have to correct, or at least that the veterinarians have to correct.

Dr. Brooks made the statement that the state department of New York had found that in a number of cases of so-called septic sore-throat, Streptococcus epidemicus was not incriminated. I don’t question that at all. I am wondering whether Dr. Brooks could tell us whether the organisms they did find in sore-throat were definitely associated etiologically with the sore-throat, and were very distinctly different from the S. epidemicus. Perhaps it is out of his line but I wonder whether he could give us a word or two on that.

Dr. Leo F. Reitger: Dr. Brooks made the statement that the state department of New York had found that in a number of cases of so-called septic sore-throat, Streptococcus epidemicus was not incriminated. I don’t question that at all. I am wondering whether Dr. Brooks could tell us whether the organisms they did find in sore-throat were definitely associated etiologically with the sore-throat, and were very distinctly different from the S. epidemicus. Perhaps it is out of his line but I wonder whether he could give us a word or two on that.

Dr. Brooks: I regret I am not a bacteriologist. When I am talking about bugs, I am stating what somebody told me. On the question of the identification of the S. epidemicus in these outbreaks I am practically altogether taking the word of the people in the state laboratory that, although they have been making very extensive and intensive studies of hemolytic streptococci for a number of years, they have not found the S. epidemicus in most of these epidemics.

Dr. Reitger: Are they hemolytic?

Dr. Brooks: They are always distinctly hemolytic streptococci. The way we ordinarily determine, at least what leads us to conclude an organism is responsible for an epidemic, is finding it in the human cases and in the cows. If we find a definitely hemolytic streptococcus that shows the same cultural, immunological and various other characteristics the laboratories tell us, not all very clear to me, showing that apparently it is the same strain of organism, that convinces us
that that is responsible for the epidemic, when we find it in the cases and in the cow.

I don’t know much about the *S. epidemicus*. I know one of the outstanding characteristics in the capsule they can demonstrate, and I know there are certain other tests that other people here know a lot more about than I do.

In one of our recent epidemics, I understand that organisms conforming to those specifications were found, but my general impression, gotten from talking with the laboratory folks, is that they have the feeling that these characteristics that show up in what they call the *S. epidemicus* may show up in cultures of almost any hemolytic streptococcus if they follow them along through cultures long enough. In other words, they do not feel it is something that definitely identifies a particular kind of specific organism, but it is something that may happen to almost any of them.

Dr. Park, who I am sure many of you know, who is the head of the Research Laboratory of the New York City Health Department and has been for many years, author of one of the best known books on pathogenic bacteria, a few years ago when one of us mentioned *Streptococcus epidemicus* to him said, “There ain’t no such animal.” Dr. Frost doesn’t agree.

**PRESIDENT ROBINSON:** Now we come to another subject, “Transmissible Diseases of Swine.” Dr. A. T. Kinsley, chairman of the Committee on Transmissible Diseases of Swine, will present the report.

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

**REPORT OF COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE**

**DR. A. T. KINSLEY, Chairman, Kansas City, Mo.**

Dr. C. N. McBryde, Ames, Iowa. Dr. H. D. Port, Cheyenne, Wyo.
Dr. E. A. Cahill, Kansas City, Mo. Dr. H. J. Shore, Fort Dodge, Iowa.
Dr. Ralph Graham, Jefferson City, Mo.

It is assumed that your Committee on Transmissible Swine Diseases should confine its report to other than parasitic diseases.

The past year has been unusual because of the unprecedented drouth. Incident to the drouth there has been considerable movement of swine. However, the death-toll has been below the average.

There has been no unusual prevalence of infective diseases with the possible exception of erysipelas and intestinal disorders. Erysipelas is, according to reports, becoming more widespread. It is the opinion of the Committee that further laboratory studies should be made of erysipelas, particularly in relation to methods of prompt diagnosis, permanent immunization and further, definite efforts should be made by sanitary officers not only to control this malady on infected premises, but also prevent its further spread.

Intestinal disorders in swine continue to be a complex problem because of the apparently numerous etiologic factors. In former years chronic enteritis associated with suistestifer infection predominated but recently acute enteritis is apparently more prevalent. Salmonella and coccidia have definitely been established as etiologic factors in enteric disorders in swine. Salmonellosis has apparently been less prevalent than usual this year, with the possible exception of some districts in Illinois. Hemorrhagic dysentery is on the increase, particularly in the Sioux City territory. Spirochetes, amoeba, trichomonads and balantidium have been identified in cases of acute hemorrhagic
TRANSMISSIBLE DISEASES OF SWINE

enteritis, but their etiologic relationship is still a moot question. The acute type of enteritis is readily transmissible, the disease spreads rapidly, is highly fatal and does not respond to treatment. It is certain that the enteric disorders regardless of cause are factors that must be reckoned with in cholera immunization.

Abortion disease is on the increase, at least in some localities. The prevalence of this malady is indicated by the B. A. I. regulation requiring the use of swine for serum production that are negative to the agglutination test unless the serum be pasteurized. Further research on swine abortion should be done, particularly in relation to carriers, immunization and sanitary control measures.

Hog cholera has not been very prevalent during 1934, excepting in Eastern Iowa and Illinois, and the outbreaks that have occurred have apparently been due to field virus of low virulence. Because of the extent and character of cholera this year, there has been less vaccination than normal and the stage may be set for an extensive outbreak of cholera at any time, and we believe that swine-producers should be warned of the necessity of protecting their herds from this malady.

It is the opinion of your Committee that hog cholera is still the major swine problem that concerns sanitary officials and practicing veterinarians. It spite of the fact that there has been marked progress in anti-hog cholera serum therapy, the relative annual loss in the United States incident to cholera is still too large. This cholera loss is at least in part due, first, to the fact that the cholera sanitary control machinery has almost ceased to function, in most states; second, to the unrestricted distribution and use of virus; third, to the use of too small a dose of serum; and fourth, to community sales and the unrestricted truck transportation of swine.

We believe that the losses from cholera can be materially diminished by the adoption and enforcement, by regulatory authorities, of the following primary principles of disease control:

1. Make hog cholera a reportable disease.
2. Deputize qualified licensed practicing veterinarians as authorized quarantine officers with authority to act in outbreaks of cholera.
3. Quarantine every farm on which cholera is found. The quarantine to be maintained and enforced until the disease has run its course and the premises have been properly cleaned and disinfected.
4. Prompt and proper vaccination of all exposed herds of hogs.
5. Maintain strict supervision of community sales and restrict the truck transportation of swine.
6. Prohibit the distribution and use of virus excepting to authorized, deputized veterinarians.

Dr. Kinsley: Mr. Chairman: We recommend this report be received and referred to the Executive Committee for their consideration.

(The transcript of the proceedings did not indicate that any action was taken on this motion.—Editor.)

President Robinson: Dr. A. W. Miller, Assistant Chief, United States Bureau of Animal Industry, Washington, who was scheduled to speak tomorrow afternoon, will now present the report of the Committee on Miscellaneous Transmissible Diseases.

Dr. A. W. Miller: Before reading this report, the Committee has a question that it wishes to have this Association answer. As you know, we have a number of standing committees and, in a way, they overlap to a certain degree. Nearly every year, I think, we have to put
the question up to you as to what committee should handle some certain disease. The question this year is with mastitis. As you know, due to this emergency appropriation, the question of mastitis is looming rather large. We were requested, both by members of the Committee and by veterinarians who were not on the Committee, to include something in our report. We did not, because we were not sure as to whether it came within our purview. We would like to have the Association tell us whether that belongs to this Committee or to some other committee. I think we would like to have that answer now.

PRESIDENT ROBINSON: I will refer that to the Executive Committee.

. . . Dr. Miller read the report of the Committee on Miscellaneous Transmissible Diseases. . . . (Applause.)

REPORT OF COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES

DR. A. W. MILLER, Chairman, Washington, D. C.

Dr. Jacob Traum, Berkeley, Calif. Dr. E. A. Watson, Hull, Quebec.

Dr. L. Enos Day, Chicago, Ill. Dr. I. D. Wilson, Blacksburg, Va.

Dr. C. H. Clark, Lansing, Mich. Dr. Mark Francis, College Station,

Dr. A. J. DeFosset, Columbus, O. Tex.

Dr. C. H. Hays, Pierre, S. Dak.

Your Committee this year is limiting its report to a brief discussion of equine encephalomyelitis, vesicular exanthema in swine, and foot-and-mouth disease.

ENCEPHALOMYELITIS OF EQUINES

Outbreaks of equine encephalomyelitis occurred again this year in both western and eastern sections of the country. In Utah, the disease made its appearance in the early summer months and, unlike last year, was less severe and did not recur later. This year's outbreak in South Dakota was somewhat less extensive than that of last year. During the summer, equine encephalomyelitis appeared to be less prevalent along the Atlantic Seaboard than in the previous summer. It was found in approximately the same regions but in New Jersey a few cases were detected inland. The epidemiological findings indicate that the disease is insect-borne and that transmitting agents are more numerous in or near salt marshes. Work with these salt marsh mosquitoes at the Rockefeller Institute in Princeton shows that they will all transmit the virus from infected to normal guinea pigs and that Aedes sollicitans, the most numerous species, will transmit the virus from an infected to a normal horse and to guinea pigs.

Vaccination procedures have been further studied by various agencies. The formalized virus vaccine, as prepared by the U. S. Bureau of Animal Industry, which had already given promising results experimentally, was subjected to a test under field conditions, the product being used on more than 300 horses and mules. This test demonstrated the safety and practicability of this vaccine as an immunizing agent and the indications are that it possesses merit as a preventive agent. Not the least of its advantages is the impossibility of its creating virus carriers.

At this time it can not be said with certainty that living virus vaccines may not produce the carrier state or even the actual disease in the treated animal and, accordingly, until the field investigation of inactive virus vaccine has been exhausted, the use of living virus would appear to involve unnecessary risk.

Reports from the field appear to warrant the continuation of anti-encephalomyelitis serum both as a preventive and therapeutic agent.
FOOT-AND-MOUTH DISEASE

Foot-and-mouth disease continues to be very prevalent throughout Europe, Asia, Africa, and South America. Sixty-six countries in those continents are classified by the U. S. Department of Agriculture as infected with this disease. Several outbreaks have occurred in Great Britain but they have been promptly controlled and eradicated through methods of slaughter similar to those which are followed by this country. Switzerland, in an exposed position but resorting to strict quarantine and slaughter measures, has been free from the infection during recent months; also the outbreak to which we referred in our report last year as appearing in the Union of South Africa has apparently been eradicated. We have nothing new to report of particular importance with respect to the research studies that are being made of this disease.

VESICULAR EXANTHEMA IN SWINE

Your Committee in the report which it transmitted a year ago, under the title "California Outbreak," made reference to infection among garbage-fed swine in southern California. In June of this year, this disease again appeared among garbage-fed swine, this time in central California. In several tests with viruses from different ranches swine were readily infected by local, intravenous, or intramuscular inoculation. Mild lesions were induced in three of six horses but the results with cattle and guinea pigs were negative. Virus which was sent to the Bureau of Animal Industry at Washington induced the disease in hogs and horses but not in cattle, sheep, goats, or guinea pigs. In October, the disease made its appearance on garbage-feeding ranches in southern California. In two separate tests in the field results similar to the one previously reported were obtained. Virus from two of these ranches sent to Washington gave similar results.

The definite diagnosis of this disease is more important in this country where the slaughter method of combating foot-and-mouth disease is used than in countries where that disease is enzootic and against which countries there are almost constant quarantines. Therefore, extreme caution has been exercised in making a diagnosis in suspected cases, and it is perhaps on this account that research workers of this country described a new entity as vesicular stomatitis and they are now bringing to our attention another foot-and-mouth-like disease which resembles both vesicular stomatitis and foot-and-mouth disease but differs sufficiently from either to warrant the use of a new term to identify it.

Vesicular stomatitis, when it appeared in cattle, was practically the only disease which caused the experienced observer any difficulty in differentiating from foot-and-mouth disease, and even then no serious difficulty was encountered in making the diagnosis until 1932 and again in 1933 when outbreaks of a disease occurred among swine in southern California indistinguishable clinically from natural or experimental foot-and-mouth disease, and from experimental vesicular stomatitis in this species, but which differed from either foot-and-mouth disease or vesicular stomatitis in its failure to induce lesions in bovines and guinea pigs, and differed further from foot-and-mouth disease in that in 1933 it showed slight pathogenicity for horses when inoculated on the dorsal surface of the tongue. The lesions in horses are generally so much milder than those produced by vesicular stomatitis that there is a marked degree of difference there also.

The 1933 virus was sent to Washington and to the Reichsforschungs Institut at Reims, Germany, and at both places the same results were obtained as were reported from the field work in California, namely, swine were readily infected, a large percentage of tested horses were
infected with mild lesions, and negative results were obtained in cattle and guinea pigs. In Washington, it was demonstrated that the swine virus of 1933 differed immunologically from the two types of vesicular stomatitis they have and in Germany it was found to be immunologically different from the three types of foot-and-mouth disease.

In 1933 the hogs on infected ranches in California were slaughtered and burned and the premises cleaned and disinfected without establishing a definite diagnosis. This year the disease is being handled somewhat like outbreaks of vesicular stomatitis. To this disease the name of vesicular exanthema of swine is being given.

DR. MILLER: I move that this report be referred to the Executive Committee.

DR. DUCKWORTH: Mr. Chairman, the report spoke of the California condition reported on last year. You know, in 1932, the condition was diagnosed as foot-and-mouth disease. Some of us were of the opinion that it wasn't foot-and-mouth disease, as we had seen the condition on two previous occasions in California.

Dr. Hurt, who is at the meeting here, and I talked about that in 1933, and we agreed we did not think the condition in 1932 had definitely proven itself to be foot-and-mouth disease. It had gone into three counties and had not touched a cow, and that does not spell foot-and-mouth disease as we have known it out there, no matter how you try to stretch it.

In 1933, then, when the same condition came along again in an isolated area, in conjunction with the Bureau of Animal Industry, it was decided that the logical thing to do was to get that under the ground and treat it as foot-and-mouth disease and endeavor to make a diagnosis while that work was going on.

As a result of that, experiments were carried on as long as there was living infection above the ground. When the last animal went down, we took no chances; we put the test stuff down with it. But by that time we had determined we could not inoculate cows or guinea pigs but we could inoculate horses. At that time a diagnosis of foot-and-mouth disease could have been made, the same as it was in 1932. Some parts of the world had just lifted a quarantine against this country because of foot-and-mouth disease. We would have had it imposed again in 1933, and, while most of our unity, for the most part, binds us together in the United States, in this particular case it would have been detrimental to New York, it would have been detrimental to Iowa, had California continued to be infected with foot-and-mouth disease. The United States would have been regarded as an infected country.

By the experimentation that has been done, then, we have been successful in keeping our country free of foot-and-mouth disease, when that was the actual fact of the case, instead of saying, "Here is a condition we cannot tell from foot-and-mouth disease; maybe we had better call it foot-and-mouth disease." So we have had this condition in 1932, in 1933, in June in the San Francisco Bay area and in October in the Los Angeles area. The Los Angeles area may be an original infection. We cannot trace a connection with the San Francisco area, with some 450 miles between. We know, then, of this condition three times in California, and possibly four. If the Los Angeles area can be hooked up with the San Francisco area, then it is only three; if not, it is four original infections in garbage-fed hogs. We don't know why our hogs seem particularly susceptible to this thing, or why it hits California and does not hit other states. Maybe you folks can answer that and can help us out.
We know that we have these animals with beautiful blisters on their noses; they are lame. When a good diagnostician looks at it he says, "Oh, boy, you can call that what you want to, but that is foot-and-mouth disease." But definite work now, on the part of the German investigators, confirming what was found by our men in California and by the Bureau men in Washington, going further with immunological tests, shows that it is not foot-and-mouth disease. We have a new kind of a package out there. We don't know just exactly what we are going to do with it. It doesn't play according to rules.

We had an idea, for instance, a perfectly logical one, that this was a garbage-borne condition. "We will see what we can do with a little meat scrap. It must come from meat scrap." So on one particular premise we harvested some virus off fresh vesicles on noses and feet. We took two hogs, one with a temperature of 108 and one about 107.5; we killed them. We took blood from them, and we made meat scrap of them. We had pens of about 60 weanling pigs, some 700 or 800 of them, about 60 in a pen.

We injected virus into one bunch, that we had harvested from the nose and feet. We injected into another pen the blood from the two hogs that we killed. We fed the meat scrap to half a dozen more pens, and we had pens in between to which we did nothing. In the hogs that we injected with virus, about half of them broke in about 36 hours; the ones that we injected with blood, I think there were two of those; the ones we fed meat scrap didn't do anything, and a pen in the middle, that we didn't touch at all, had five break.

It did not seem such a simple thing then. Maybe this thing doesn't come from meat scrap; I don't know. Maybe the idea of the hog on garbage renders him particularly susceptible to this condition.

We had grain-fed hogs that had never had any garbage, never had anything but grain. We brought them in and inoculated them, and they broke to perfection. So it is not due to the diet of the animal.

We have found, up until recently, uniformly a high temperature in affected hogs up until the time the vesicles break. When the vesicles break, the temperature will start down.

However, just a week or so ago, Dr. Hurt and his men found a small place in Los Angeles County, some 250 head of hogs, maybe two-thirds of them Chester Whites and a third of them Hampshires, with infection confined to the Chester Whites; good vesicle formation but no temperature.

About the time you thought you learned something about the condition, it would slip up with a new aspect and upset what you thought you had learned about it. We are endeavoring to the best of our ability to keep the condition confined. I have had to sacrifice the other work we have out there. We, like the rest of you, had to suffer a cut in budget, and I had to pull the men off their regular field work and confine them to hog work. We found one thing that appears to be all right, that, after the hogs have manifested the condition, we can separate them, and when those lesions heal, they are safe to be moved. You can appreciate that, economically, you cannot tie up a mess of 10,000 or 50,000 head of hogs and keep them confined until this condition has cleared up throughout the farm, because it might take six months to go through it. The stuff has to be moved. The convalescent hogs are safe to move. In pens of fat hogs ready to go, half a dozen hogs, in a pen, say, of fifty, would break. "That is fine. That will go through this pen pretty quickly." The lesions heal rapidly. It is surprising that there is no secondary infection.

I don't know of anything in the world that is dirtier than a hog's nose, but that sore spot, that will denude the entire upper surface of his nose, will heal, after it breaks, in three or four days, and in a week it is all dried over and in good shape.
In some of these pens, then, where we had half a dozen hogs that healed completely, that showed original infection about three weeks before, we thought, "Well, now, half a dozen hogs in this pen had this condition in good shape. It must be that the rest of the pen had the disease in a mild form and have not manifested any external lesions and recovered; therefore, they are safe. Either that, or they had a natural degree of immunity and would not come down."

That was a swell theory. We were going to prove that. We took half a dozen more pigs in the pens and stuck some virus into them, and they broke. What are you going to do with a condition like that? It just doesn't want to play with you at all. For ease and peace of mind, and all that sort of thing, it if it had been diagnosed as foot-and-mouth disease and quarantines had been piled down against the United States, probably Hurt and myself could have slept a little better, but it would have been terribly expensive. So we are satisfied that we have carried it along as we have and tried to control it and that quarantines have been withheld. But, gentlemen, we still have a very serious problem out there. I hope that none of you gentlemen ever have it. But, if you do, then you are going to lie awake and wonder about it a few nights, just as we have done and are still doing in California. We cannot conceive that this thing has been some place else; still, it is awfully hard to imagine a brand-new disease dropping down out of the sky. We cannot conceive that this thing has been some place else and not reported. The fact that it is not described in world literature sort of handcuffs us, and we do not know where to go to look for a possible avenue of entry. We know that out there our foreign garbage on ships is taken care of by federal regulation. We don't think any of that gets in. Even if it does get in, how does it bring this disease? We couldn't give it to the pigs by giving them infected meat scrap. It is a problem.

We hope that maybe next year we will have an answer for you as to what it is all about. Whether the thing is going to get a foothold in the country as a result of being there, we don't know.

The condition itself, as to its effect on the hogs, is not very serious. As I stated, it heals rapidly. Heavy hogs on concrete or on boards are pretty sick hogs; they don't like to get on their feet. You can kick them and they will squeal and object very strenuously to getting up. But hogs running on dirt floors, little pigs, weanlings, and all that, are not very seriously affected. I don't know that you could measure the damage to the individual pig in dollars and cents. You might say, then, that that is a differentiation from foot-and-mouth disease. Foot-and-mouth disease literally melts the flesh off a fat hog; it will if it is pretty virulent. But we have seen it go through the pens, and it seems to spread, but the effect on the animal has been mild. We could not differentiate it economically. It is very annoying to regulatory officials. (Applause.)

PRESIDENT ROBINSON: If there is no further discussion, we will recess until 1:30.

... The meeting recessed at 12:10 p.m. ...

RECESS

THURSDAY AFTERNOON, DECEMBER 6, 1934

The fourth session convened at 1:55 p.m., President Robinson, presiding.

PRESIDENT ROBINSON: Gentlemen, will you please come to order? The subject of this afternoon's session is "Tuberculosis." The first speaker
on the program is Dr. A. E. Wight, Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C., who will talk to us on "Progress and Status of Co-operative Tuberculosis-Eradication Work." (Applause.)

Dr. Wight: Mr. Chairman, Ladies and Gentlemen: I find that the map is a little small for this large room. However, there is a miniature of the map in the little pamphlet that is being passed around, but you will notice in that pamphlet, if you look at the map closely, that Minnesota does not have a star or is not all white. That is for the reason that the map in the book was prepared November 1, whereas the large map was prepared December 1. Minnesota was placed in the modified area December 1 of this year, making it the eighteenth state in that classification.

... Dr. Wight then read his paper. ... (Applause.)

PROGRESS AND STATUS OF COÖPERATIVE TUBERCULOSIS-ERADICATION WORK

By A. E. WIGHT, Washington, D. C.
Chief, Tuberculosis Eradication Division
Bureau of Animal Industry, U. S. Department of Agriculture

Again, it is my privilege to present to this Association the usual annual report on the progress made in the control and eradication of animal tuberculosis in the United States. During the past year, several important events occurred in connection with this work.

It will be recalled that during the 1933 meeting of this Association there was some discussion regarding the prospects of obtaining funds from the Civil Works Administration for use in testing cattle for tuberculosis. In January of this year, the CWA made the tuberculin-testing of cattle one of its projects. It was possible, therefore, to employ veterinarians and helpers from funds provided by that Administration to engage in this work. The activity continued about three months, during which time 917,401 tuberculin tests were applied to cattle by veterinarians paid from these funds. The work was taken up in eight states. In June of this year, funds provided in the LaFollette amendment to the Jones-Connally Cattle Bill were furnished for tuberculosis-eradication work, making it possible to extend this work in states where it was deemed advisable to do so. These funds, used for both operating and indemnity purposes, are administered by the Bureau of Animal Industry, and the work is carried on in cooperation with state authorities. With these additional federal funds, it has been possible to make much progress in tuberculosis-eradication work during the year now coming to a close.
STATE AND FEDERAL FUNDS AND LEGISLATION

State and regular federal funds available for tuberculosis eradication among livestock have been somewhat reduced, but, with the addition of emergency funds, it was possible to continue the retesting and other necessary work in all parts of the country. During the next few months the legislatures of practically all the states will again be in session, and the question of necessary funds to conduct tuberculosis-eradication work will be one that will have to be given consideration. In many states it will be possible to conduct the work with reduced appropriations, owing to the progress that has been made in eradicating the disease, but it is hoped that sufficient funds will be made available to carry on the necessary retesting work, which is very important. More satisfactory results are usually obtained when the states can arrange to attend to the retesting work in modified areas, thus relieving the counties of this expense.

THE EXTENT OF BOVINE TUBERCULOSIS

On May 1, 1934, the seventh survey to determine the approximate extent of bovine tuberculosis in the various counties in the United States was completed. This survey indicated that the approximate average degree of tuberculosis among cattle had been reduced to 1.1 per cent. It will be recalled that the first survey, made in 1922, indicated that 4 per cent of all the cattle in this country were affected with this disease. In this most recent biennial survey, it was found that there were only 62 counties, located in nine states, wherein the degree of infection of bovine tuberculosis was more than 7 per cent. The survey further indicated that in only 17 counties, located in five states, did the infection of bovine tuberculosis exceed 15 per cent. Two years ago, the infection of this disease exceeded 7 per cent in 93 counties, and in only 48 of them did it exceed 15 per cent. Since the completion of this most recent survey, much work has been done in the more heavily infected counties, and the degree of infection has, therefore, been further reduced to a considerable extent.

During the last fiscal year, about 9,500,000 cattle were slaughtered under federal inspection, exclusive of known reactors to the tuberculin test, and of this number 34,509 (0.36 per cent) showed some evidence of tuberculosis. The total number of advanced cases among those retained was only 9,329, a substantial reduction in the amount of infection as compared with what existed ten years ago.
ACCREDITED HERD WORK

According to the records of the Bureau of Animal Industry, there were, on October 1, 1934, 228,004 accredited herds, containing 3,398,951 cattle. This is some increase over the corresponding figures of a year ago. This feature of the work continues to be of much importance in several states, though in some it no longer receives much attention. In the state of New York, the retesting of fully accredited herds continues to be done by local practicing veterinarians at the state’s expense. New York has more accredited herds than any other state in the country.

AREA WORK

As usual, the greater part of the tuberculin-testing work was conducted under the area plan. During the year, November 1, 1933, to November 1, 1934, 189 counties have been added to the list of those in the modified accredited area, indicating that the degree of infection of bovine tuberculosis exists to less than one-half of 1 per cent. In addition to these counties, five towns in the state of Vermont were also placed in that status. The uniform plan for maintaining modified accredited areas requires that either a portion or all the cattle within such areas be retested at stated intervals, depending upon the degree of infection found on the original test. During the twelve months ended November 1, 1934, the required number of cattle, located in 437 counties and seven towns which were due for remodification, were tuberculin-tested. It is very gratifying to be able to report that as a result of these retests it was possible to remodify each county and town in accordance with the provisions of the uniform plan. Retests do indicate, however, that the infection of tuberculosis reappears in modified accredited areas, and that it is necessary to apply retests at the proper time.

On November 1, 1934, 1,893 counties, located in 45 states, were in the modified accredited area. This is more than 61 per cent, or almost two-thirds of all the counties in the United States. In addition, 81 towns in the state of Vermont had attained that classification. Area work is now in progress in 272 additional counties. It is interesting to note that Cedar County, Iowa, where so much opposition to the work developed a few years ago, was recently added to the list of modified accredited areas.

The area plan continues to be applicable in all sections of the United States. On May 1, 1934, the remaining counties in the state of Washington were placed in the modified accredited area,
making that state the 14th to attain that status. The remaining counties in Illinois were declared modified accredited areas on September 1, and those in Virginia and Oregon on November 1, making a total of 17 states in the modified accredited area on November 1, 1934.

It should be of more than ordinary interest to the members of this Association to learn that the entire state of Illinois is now a modified accredited area. For many years we have met in this state to discuss tuberculosis eradication and develop plans for its operation, and we are all aware of the great amount of work and funds that were necessary to eradicate the infection in many of the counties in Illinois. The Chicago Milk Ordinance, effective April 1, 1926, requiring all milk to be obtained from tuberculin-tested herds, was instrumental in bringing about much interest and activity in this work in Illinois and nearby states.

Counties in the western states continue to be modified under the provisions of part 2 of section 20 of the Uniform Modified Accredited Area Plan, and the testing of herds of cattle under this provision is meeting with the approval of the cattle-owners in those states. At present, much of this work in the western states is being conducted with emergency funds.

**CATTLE TUBERCULIN-TESTED FOR INTERSTATE SHIPMENT**

The greater part of the tuberculin-testing of dairy and breeding cattle for interstate shipment is performed by accredited veterinarians. During the fiscal year ended June 30, 1934, approximately 204,000 dairy and breeding cattle were tuberculin-tested by approved veterinarians, and about 26,000 cattle of this class were moved interstate after having passed a tuberculin test applied by regularly employed state or Bureau veterinarians. The total number shipped interstate for dairy and breeding purposes is slightly greater than that of the previous year.

Large numbers of cattle were tested for tuberculosis by accredited veterinarians in connection with the movement of drouth cattle for grazing purposes. It is estimated that before the drouth project is completed 1,000,000 cattle will have been tested for tuberculosis.

**JOHNE'S DISEASE OR PARATUBERCULOSIS**

During the fiscal year ended June 30, 1934, Johne's disease was reported from 15 states, in which 198 animals were condemned on account of infection. This represents approximately 5.4 per cent of the total number tested. Many tests were applied
intradermically as well as by the customary intravenous method, Johnin being the diagnostic agent used in both cases. The intradermic test was found to be quite satisfactory and further testing with it is being planned.

AVIAN TUBERCULOSIS IN POULTRY AND SWINE

During the past year, members of the Bureau of Animal Industry have cooperated with the live stock sanitary officials of those states in which avian tuberculosis is known to exist to a considerable extent. Owing to the assignment of some of the veterinarians to emergency drouth work, the avian project was curtailed to quite an extent during the last few months. However, it has been possible to interest a large number of flock-owners in this project, as well as many agencies who are interested in the proper handling of swine and poultry.

We are pleased to know that the National Institute of Poultry Industries, with headquarters in Chicago, has prepared a large number of leaflets on the subject of tuberculosis for distribution. Many of these will be distributed by employés of plants where poultry and eggs are purchased. This action should be very helpful in disseminating information on this subject.

Most of this disease seems to be located in the central and north central states. This subject is to be given especial attention on our program by Prof. H. R. Smith, who has devoted much time to the matter, and rendered very valuable service to the project.

Records of the federal meat inspection service for the last fiscal year showed a slight increase in the number of hogs retained for tuberculosis, but the percentage of carcasses condemned was considerably less than for the previous year. During the last fiscal year, 5,102,636 hogs, or about 11.1 per cent of the total slaughtered under federal inspection, showed some evidence of being affected with tuberculosis, but only about 86,000 were affected with the disease to an extent whereby it was necessary to condemn the carcass as unfit for food or to pass it for cooking under the federal regulations. Ten years ago, 15 per cent of all hogs slaughtered under federal supervision showed evidence of tuberculosis, and the percentage of those condemned or passed for cooking was more than three times as large.

APPRAISAL, SALVAGE, AND INDEMNITY

The amount of salvage obtained for cattle marketed because of their reacting to the tuberculin test continues to be low, due to the general low price of this class of cattle. In September, 1934, the average salvage was about $10. The average appraisal was
about $53. The maximum federal indemnity continues to be $20 for grade cattle and $50 for registered pure-bred cattle.

**TRACING THE ORIGIN OF TUBERCULOUS CATTLE**

During the last year the value of tracing cattle from the packing centers, when tuberculosis is found on postmortem examination, has been demonstrated many times. Some very interesting reports have been received on this subject. It is hoped that more attention can be given this phase of the work in future years, as it will be of great service in checking the spread of tuberculosis in live stock. As the number of tuberculous cattle arriving at slaughtering centers decreases, it should be more practicable to trace the origin of infection. A study of the causes of reinfection of tuberculosis in herds of cattle continues to be made by the state and federal officials in charge of this project.

**RETESTS IN MODIFIED AREAS**

A study of the results of retesting herds of cattle in modified accredited areas continues to be of much interest. In a county in Minnesota, where a complete retest recently was made of all the cattle, comprising about 36,000 head, only 26 reactors were found, which were located in 17 herds. In this county there is located a very large public stock yard, and the fact that it has been possible to keep the infection in the county to such a low degree is very encouraging to the state and Bureau officials in charge of the work in that state. The infection has not only been reduced from about 4 per cent to less than 0.1 per cent, but, through the careful management of the movement of cattle from the public stock yards, it has been possible to keep the herds in the county practically free from the disease.

**PRODUCTION OF TUBERCULIN**

Before bringing this paper to a close, it is desired to mention one or two additional points that may be of interest at this time. With the vast amount of tuberculin-testing of cattle being accomplished each month in the United States, it is, of course, necessary for the Bureau to produce large quantities of tuberculin. It is very fortunate that sufficient tuberculin is available, and we are very grateful to Dr. Dorset for his wonderful discovery of "Special F" tuberculin which he described at this meeting last year and which is now being produced and used in very large quantities. During the last year an average of approximately 1,300,000 tuberculin tests have been applied monthly, and
it is probable that in another year we will observe reports of the testing of almost 2,000,000 cattle in some months.

PUBLICITY

As in the past, the Bureau and cooperating state officials have kept the public fully informed concerning the progress and developments in this work. The metropolitan and rural press have both been liberal with space. Radio broadcasting stations also have flashed over their vast systems timely news and informative statements helpful to tuberculosis-eradication work. There have also been exhibits on the work at various places, including those at the Century of Progress and the Twelfth International Veterinary Congress.

The latest addition along information lines is a film strip which is virtually a vest pocket stereopticon show. It consists of a series of 55 pictures on a film easily carried in a pocket, but which can be projected in any desired size for a basis of a lecture. A set of pictures in this form can be obtained through the Extension Service at a cost of 45 cents.

In August of this year, many veterinarians of this country were fortunate in being able to attend and participate in the Twelfth International Veterinary Congress in New York. Tuberculosis was discussed at several sessions, and methods so successfully used here were of especial interest to many foreign delegates. One of them remarked that the monthly record of tuberculin-testing in the United States reminded him of bacterial counts in his country. The discussions of this Congress, which are to be recorded in the proceedings, contain much of interest to those of us concerned with the eradication of tuberculosis in live stock in this and other countries.

CONCLUSION

Although this paper contains some statistical information, more complete figures on the subject are available in a pamphlet recently prepared by the Bureau of Animal Industry. The pamphlet is available at this meeting. If additional copies are desired they will be furnished later, upon request.

In conclusion, I wish to thank you for your kind attention to these remarks.

PRESIDENT ROBINSON: It affords me great pleasure at this time to introduce to you another public health worker, Dr. Henry D. Chadwick, Massachusetts Commissioner of Public Health, Boston, Mass. His subject is "The Incidence of Tuberculosis in School Children."

... Dr. Chadwick read his paper. ... (Applause.)
THE INCIDENCE OF TUBERCULOSIS IN SCHOOL CHILDREN

By HENRY D. CHADWICK, Boston, Mass.
Massachusetts Commissioner of Public Health

Tuberculosis, as one of the acute, communicable diseases of children, has been recognized but recently. When we list the acute communicable diseases of children by their relative standing as causes of death, we find that tuberculosis is exceeded only by whooping-cough in the group under five years of age, and is followed by measles, diphtheria and scarlet fever, in the order named. In children under 15, tuberculosis heads the list and is followed by diphtheria, whooping-cough, scarlet fever and measles. If we group together all children under 20 dying of these diseases, tuberculosis has a long lead; in fact, it causes the death of three times as many children as its nearest competitor, diphtheria, and in the age group 10 to 19, tuberculosis is responsible for more than three times as many deaths as all the acute communicable diseases together in this age group.

Tuberculosis is therefore the most serious disease of children. Yet, 25 years ago, when Massachusetts opened three new sanatoria in addition to the one built in 1898, no beds were planned for children. The state did not realize that it had a responsibility in this direction. Instead, attention was focused on caring for the adult with obvious pulmonary disease. We were emphasizing the need of early diagnosis, of finding the incipient case. We blamed the physicians and the medical schools for not teaching their students to find pulmonary tuberculosis while it was incipient, little realizing that we were expecting them to do the impossible. Newer methods of diagnosis had to be developed and applied before the cases of really incipient pulmonary tuberculosis could be found. After such means were provided, we discovered that really incipient tuberculosis was in most instances to be found only in children. Furthermore, we were waiting for symptoms to develop before suspecting the disease. We needed the tuberculin test and the x-ray to aid us in diagnosis and the knowledge was slowly acquired that tuberculosis oftentimes has a latent period during which it develops insidiously without producing signs and symptoms to call attention to its presence.

The extensive use of the tuberculin test to determine the incidence of infection added to our knowledge, the development of the x-ray, particularly to a degree that made it practicable for diagnosis of the condition, came about quite slowly; in fact, it
was about 25 years following Roentgen’s discovery of the x-ray in 1895 before it was used much in chest examinations, even in sanatoria. The really incipient form that occurs in children can be demonstrated only by an x-ray film.

In 1924, the Massachusetts Department of Public Health began its Ten-Year Program to find the incidence of tuberculosis among school children. During the ten years just finished, approximately 400,000 school children had been given the tuberculin test and over 100,000 have had x-ray films of the chest.

**FINDINGS**

*Incidence of infection:* The rate of infection rises quite regularly from 15 per cent at age 5, to 45 per cent at the end of high school. There is no difference between rate of infection for boys and girls. Infection is found twice as frequently in children with a history of contact.

*Incidence of disease:* About 5 per cent of the children tested are found to exhibit some evidence of tuberculosis in their x-ray films. Approximately 1.5 per cent show definite childhood type tuberculosis.

About 3.5 per cent are classified as suspects.

Only one in 1,200 of the 250,000 grade children were found to have pulmonary tuberculosis of the adult type. Of 35,368 high school students tested, 87 cases of pulmonary tuberculosis adult type were found, or one in about 400 tested, or one in 164 positive reactors.

**SCREENING OUT THE TUBERCULOUS CHILDREN**

Other screens than tuberculin-testing have been used for this purpose but have not proved satisfactory. For example, much time has been given to weighing and measuring children to determine the degree of underweight and then examining those who were 10 per cent below average weight. This plan of selection was given up when cases of tuberculosis were found almost as frequently in children who were average weight or overweight. The state of nutrition is not influenced unfavorably in the early stages of tuberculosis, and malnutrition and underweight, therefore, are not reliable guides in picking out the tuberculous children.

Physical examination of all school children is not of much value in finding the children with early tuberculosis, as changes in breath sounds and the percussion note cannot often be detected until after the disease has passed the incipient stage.

Children who are known to be exposed to tuberculosis in the homes show twice as many to be infected, and in this group the
proportion of pulmonary cases was ten times in the grades and 30 times in the high schools more frequent than in the non-contact group. We cannot, however, be satisfied with the examination of only the contact children, as many more are exposed to infection from undiagnosed or unsuspected cases of tuberculosis. Therefore, underweight, physical examination and history of contact are all inadequate and unreliable screens to use in separating the tuberculous from the non-tuberculous children.

**STEPS IN THE PROCEDURE FOR DIAGNOSIS**

The tuberculin test alone of all the methods tried is the one that will sift out practically all of the infected children. Second, an x-ray of these infected children will determine the ones who are diseased. Third, the physical examination of those who show x-ray evidence of disease is needed to determine whether or not the condition seen in the x-ray is due to tuberculosis or to some other disease. When the examination as outlined above has been completed, we have the children divided into two major groups—the negative and the positive reactors.

First, the negative cases. These are the ones who did not react to the tuberculin test. They will be approximately 75 per cent of the elementary grade pupils and 60 per cent of the high school students. The possibility of tuberculosis can thus be eliminated in this large group.

Second, the positive reactors. They will include about 25 per cent of the grade children and 40 per cent in the high school. They are the infected children, which in itself is not of serious consequence unless the infection is excessive and has resulted in disease. The x-ray is necessary to determine this.

When these procedures have been carried out in a classroom, the physician has the evidence needed to determine what children have tuberculosis, the type and the extent of the disease.

After examination of the children, the physician will list them in four classes: First, those with the adult type of pulmonary tuberculosis; second, those with the childhood type; third, the suspects (these are the ones in which there is some evidence of tuberculosis, but not definite enough to make a diagnosis); fourth, those with non-tuberculous disease of the lungs—such cases are occasionally found.

**DISPOSITION OF THE TUBERCULOUS CHILDREN**

Approximately 5 per cent of the children will need supervision or treatment. The management of these tuberculous children varies with the type and extent of the disease.
The childhood type: Those with this type of disease have very little involvement of the lungs. The disease is mainly in the lymph-nodes at the root of the lungs. The course is mild and tends to heal. The children need not be excluded from school except in a few instances where they require more intensive treatment than can be obtained at home. It is important, however, that the parents and other members of the household be examined to determine if possible the source of the infection.

The children themselves will usually become adjusted to their disease, which will heal slowly provided they are guarded against further infection and can have reasonably good home care. They are handicapped, however, and should be carefully supervised and their school activities modified. They should be assigned to an open-air school or open-window room, not so much for the additional fresh air, which of course is desirable, but far more important are the additional rest periods that are routine in such classrooms. The nutrition of these children should have special attention. Suitable food to supplement an inadequate breakfast is better served at the beginning of the session than later in the morning. A hot noon lunch should be supplied. A rest period of at least an hour during which the children may sleep is most essential. Then a light lunch before dismissal is desirable.

The school nurse should obtain the parents' cooperation in getting their children to bed reasonably early. No home school work should be given. They should be excused from all gymnasium work, and indoor athletics should be forbidden. Competitive games are a source of danger, as the strain of such contests may cause a spread of the disease. An x-ray examination of the chest every six months is needed to show the course of the disease and used as a guide in directing the child's activities.

The suspects: The children classed as suspects may attend regular classes and take part in the usual school activities with the exception of competitive sports. These children should be kept under observation and x-rayed at intervals of six months until the abnormal condition clears up or a diagnosis is made.

The adult type: Those with this type of pulmonary tuberculosis should be excluded from school and receive sanatorium care. They are the ones that menace other children. They can spread infection; therefore, exclusion is important. Then again their disease demands treatment such as can be obtained in sanatoria. They have a more serious form of tuberculosis and at best the prospect of recovery is poor. Fortunately, only one in
about 1,200 grade children and one in 400 high school students have this serious form of tuberculosis.

**Prognosis**

There is without doubt a slight amount of immunity conferred by an infection with the tubercle bacillus, provided it is not excessive and the child has an average amount of resistance. However, it is important to remember that this immunity cannot be depended upon to prevent disease. A study was made last year of 862 cases of the childhood type of tuberculosis that were examined in the school clinics in the years 1924 to 1928. Thirty children, or 3.5 per cent, on the annual reexaminations showed adult type tuberculosis. Twelve more developed extra-pulmonary tuberculosis (bone and joint). A control group was studied of 405 children who reacted to the tuberculin test in the same period. They were similar in age, sex, and history of family contact, but no x-ray evidence of tuberculosis was seen at the original examination. Up to the end of 1932, but three of these (0.7 per cent) had developed pulmonary tuberculosis, and no cases of extra-pulmonary tuberculosis developed. In other words, there were five times as many cases of pulmonary tuberculosis among the group of children who, five to nine years ago, showed x-ray evidence of the childhood type of the disease, than were found in the group that showed no x-ray evidence although they were infected as shown by the tuberculin test. Furthermore, bone and joint tuberculosis developed in twelve children with childhood type lesions and none in the control group.

This is positive evidence of the need of close supervision of the children who have the childhood type of tuberculosis. They should first of all be prevented from further contact with an open case of tuberculosis and given supervision both in the home and in the school, and have an x-ray of their chests at least once a year so as to detect as early as possible any evidence of progressive disease. Those with more than one tuberculous nodule in the lung or numerous calcified or partially calcified nodes at the root of the lung are probably much safer if they can have a year of sanatorium care where the routine and conditions are adapted to their handicap. It is probable that such care tends to aid healing and make less likely the spread into the lungs or, through the blood-stream, affect the bones or joints.

**Bovine Tuberculosis**

Bovine tuberculosis is being rapidly eliminated in Massachusetts. A systematic campaign has been carried on for several years by the federal and state governments with splendid results.
Practically all of the cattle of the state have now been tested one or more times, and the reactors have been slaughtered, and about 85 per cent of the milk used in the state is pasteurized.

The results of these measures have been reflected in the steadily decreasing incidence of tuberculosis, found in children, of types frequently caused by the bovine form of the tubercle bacillus. These are: tuberculosis of the lymph nodes, tuberculosis of the peritoneum and intestines, generalized tuberculosis, and tuberculosis of the bones and joints, conditions that have caused the death and crippling of many children. Lakeville State Sanatorium, Massachusetts, is an institution for the care of bone and joint tuberculosis. Dr. Chang, a member of the staff of that sanatorium, has reported a study of 200 patients to determine whether their disease was due to human or bovine infection. As will be seen by table I, the cause of the disease in 71 per cent of those under five years of age, and 27.5 per cent of the whole group, was the bovine type of the tubercle bacillus.

**TABLE I—Results of a study of 200 cases of tuberculosis.**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Cases</th>
<th>Human No.</th>
<th>Human %</th>
<th>Bovine No.</th>
<th>Bovine %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 years</td>
<td>24</td>
<td>7</td>
<td>29.0</td>
<td>17</td>
<td>71.0</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>25</td>
<td>11</td>
<td>44.0</td>
<td>14</td>
<td>56.0</td>
</tr>
<tr>
<td>11 to 16 years</td>
<td>32</td>
<td>21</td>
<td>65.6</td>
<td>11</td>
<td>34.4</td>
</tr>
<tr>
<td>17 years and over</td>
<td>119</td>
<td>106</td>
<td>89.0</td>
<td>13</td>
<td>11.0</td>
</tr>
<tr>
<td>Total cases studied</td>
<td>200</td>
<td>145</td>
<td>72.5</td>
<td>55</td>
<td>27.5</td>
</tr>
</tbody>
</table>

Since 1910, when pasteurized milk first began to be used in Massachusetts to any extent, the rate from other forms of tuberculosis than pulmonary has dropped 92 per cent, from a rate of 46 to 5 per 100,000. During the same time, the rate for pulmonary tuberculosis has dropped 64 per cent, from 133 to 47 per 100,000. In 1908, 2,051 persons died of non-pulmonary forms of tuberculosis, of which a considerable percentage were undoubtedly of bovine origin. This year the deaths from all forms, including pulmonary tuberculosis, will not much, if any, exceed this total. The evidence is conclusive that the eradication of tuberculosis, both human and bovine types, is near at hand, provided we put into effect the knowledge we have and utilize to the utmost the means of control that now are available. The work should go on with increasing energy now that the goal is in sight. No false sense of security should be permitted to slow
down efforts necessary to find sources of infection whether they be in men or cattle. The human race remains susceptible and must be protected by extermination of the virulent species of the tubercle bacillus.

DR. WISNICKY: Mr. Chairman, I move that we extend to Dr. Chadwick a rising vote of thanks for his splendid paper.

. . . The audience extended a rising vote of thanks to Dr. Chadwick.

. . .

PRESIDENT ROBINSON: The next paper is by Prof. H. R. Smith, Live Stock Commissioner, National Live Stock Exchange, Chicago, Ill., on "The Significance of the Avian Tuberculosis Problem." (Applause.)

PROFESSOR SMITH: Mr. Chairman, Ladies and Gentlemen: I know we have all enjoyed Dr. Chadwick's talk very much. In this connection, I think we all feel obligated to the medical profession as a whole for the support they have given us in this big project. All over the country we have had wonderful support from health associations and prominent medical men.

Dr. Wight made reference to the Chicago milk ordinance. Many other towns have passed ordinances which had a very decided influence in promoting the campaign. Yesterday I had a letter from Dr. J. A. Myers, Professor of Preventive Medicine at the University of Minnesota, and it was a very fine letter, commending the men of this group for the work that has been done. He called attention to the fact that it has led the way to work along similar lines on the human side. I believe they are doing in Minnesota some area testing in the human family.

I have condensed my talk as much as possible in the hope that there will be opportunity for a little discussion of this subject afterwards.

. . . Professor Smith then read his paper. . . . (Applause.)

THE SIGNIFICANCE OF THE AVIAN TUBERCULOSIS PROBLEM

By H. R. SMITH, Chicago, Ill.

Live Stock Commissioner, National Live Stock Exchange

The impressive results of the national campaign to eradicate tuberculosis from cattle, both economically and from a public-health standpoint, are a real tribute to the veterinary profession, and to the nation as a whole. Seventeen years ago, when this campaign was launched, the incidence of tuberculosis in cattle was high over a large area. Today there are 18 accredited states, and two-thirds of all counties in the country have attained this distinction. It is significant that more than 3,000,000 tuberculous cattle have been removed by the application of the tuberculin test.

What are the results? During the fiscal year ended June 30, 1934, there were, according to the records of the U. S. Bureau of Animal Industry, only 7,880 cattle carcasses, exclusive of reactors, condemned for tuberculosis at all points under federal
inspection in the United States. This was 0.08 per cent of the total number slaughtered that year and one-fifth of the percentage condemned ten years ago.

During the fiscal year 1934, there were 40,038 hog carcasses condemned for tuberculosis in the United States, assumed to be infected with the bovine type from drinking infected milk and from following untested cattle. This was 0.09 per cent of the total slaughter that year and less than one-half as high as ten years ago, when there were 100,110 hog carcasses condemned for this disease. The declines in losses at Chicago are much greater than for the country as a whole because practically all of the north central states are now accredited.

Whereas in earlier years the combined loss on cattle and hog carcasses sterilized and condemned for tuberculosis—the bovine type—was greater than the loss on hogs—largely the avian type—it is now the reverse. On the basis of current market values, the combined loss on cattle and hog carcasses sterilized and condemned for tuberculosis in the United States during the fiscal year 1934 was $1,195,229 and the total loss on hogs' heads was $2,143,107, nearly twice as great.

We have made remarkable progress in reducing the losses from bovine tuberculosis and have made some gains on the avian type, as indicated by government records showing 11.1 per cent of all hogs slaughtered in 1934 retained for tuberculosis, compared with 15.2 per cent in 1924, the peak year, but there is much yet to be done. We should, of course, bear in mind that some work on the bovine problem has been done in a few of the states for a period of 40 years and in all of the states for 15 years, while work on the avian type has been confined to the past 12 years in a very general way and in isolated communities intensively.

Now that the cattle-testing program is so far advanced, it is to be hoped that the same ingenuity, earnestness and aggressiveness that the members of this organization have given to the cattle problem may be applied to the eradication of this disease in poultry. There are three important objectives: (1) to put the poultry industry on a more profitable basis; (2) to remove a serious loss to the swine industry, and (3) to eliminate some degree of confusion in the interpretation of the tuberculin test in cattle where this disease exists in the poultry flock.

To have an adequate conception of the seriousness of the disease situation in poultry, one should spend a few days with field veterinarians engaged in this work as it has been my privilege to do. A flock free from disease is the exception in certain sections of the north central and middle west states. The accumula-
tive mortality loss is large in these states, but the losses from reduced vitality and slow response to poultry-feeding operations are infinitely larger. A serious handicap to progress in solving this problem is the complacency of the flock-owners. Field investigations show that not to exceed one out of five flocks disclosing reacting birds gives any outward evidence or clinical symptoms of tuberculosis. Naturally, when the owner is not aware of the presence of the disease, he is not keenly interested in any plan of eradication.

Unlike other classes of live stock, we do not have postmortem inspection of poultry. Had it not been for our system of federal meat inspection revealing increasing losses from condemnations of beef and pork each year, our producers would not have been awakened to the needs of a systematic campaign of eradication. Federal meat inspection, therefore, not only guarantees the consumer wholesome beef, pork and mutton, but it also serves as a gauge to register disease conditions on our farms.

If we should inaugurate now a federal system of postmortem poultry inspection, the losses on rejects, eventually a producer's loss, would be heavy in the two northern tiers of states of the central group from Michigan and Ohio to the Dakotas. A large poultry-canning establishment located in this area that has post-mortem inspection was compelled to make purchases from states farther south because of heavy condemnations in local supplies. It is to be hoped that substantial progress can be made to remedy this situation to avoid a very general consumer demand for post-mortem inspection of poultry.

Relative to objective 2, the avian type of infection in hogs adds to the cost of processing pork products and depresses prices to the producer correspondingly. Another handicap is this: Great Britain, our largest foreign customer, will not accept fresh pork from hogs retained for tuberculosis. In my contacts with the meat-packing industry, I have been greatly impressed with the efforts of the various companies to find new outlets for meat products both here and abroad. Those of you who were fortunate in visiting "A Century of Progress" exposition this summer, observed the attractive meat displays made by the larger companies and the entertainment provided by them, all of which has helped to make our own people more meat-minded. The National Live Stock and Meat Board, financed by both producers and packers, has done much to further this cause.

Now that general conditions are improving, it may be possible to increase to some extent our foreign trade, especially with Great Britain. With our wonderful corn land, we can produce
pork much more economically than it can be produced in Europe and we should, in turn, open the way to receive certain foreign goods that can be produced more economically there. This is only good business. But in our efforts to expand our foreign pork trade, we must be in a position to meet all requirements as to quality of product.

The third objective needs but brief comment. It is a well know fact that tuberculosis in poultry is transmitted to cattle, fortunately in rather rare instances. Calves kept in poultry-houses have in a few cases become inoculated with the avian bacillus. This type in cattle does not usually show lesions on postmortem, but cattle thus sensitized may react, causing unnecessary slaughter and confusion. In the final stages of the cattle-testing program, it is especially desirable to remove this factor of disturbance.

If it were practical to raise hogs apart from poultry, the loss to the swine industry could be greatly reduced. However, it is the practice on most farms to permit poultry to have the general run of the premises, including the hog-lots, and it would be very difficult to bring about any change because the average farmer in the Middle West feels that his poultry should be allowed to pick up grain that might otherwise go to waste. In my opinion, it would be just as easy to eliminate tuberculosis from the poultry flock, removing the cause of this disease in swine, as to prevail upon the farmer to raise his poultry apart from the hogs. Furthermore, the loss to the poultry industry is much greater than the loss to the swine industry from the effects of the avian type of tuberculosis. The elimination of this disease from poultry benefits both industries.

Much consideration has been given to this problem by the U. S. Bureau of Animal Industry, the state officials of the Middle West, and others. At the Midwestern States Tuberculosis Conference, held in Saint Paul, Minn., during the spring of 1931, a practical program was adopted which has given favorable results where it has been put into practice. The allotment of federal funds for this work a few years ago was a move in the right direction, as several states have supplied additional funds to engage the services of veterinarians, both federal and state, who have the necessary qualifications and are sufficiently poultry-minded to succeed in this enterprise.

Encouraging reports on this work have been forthcoming, particularly from such states as Michigan, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Nebraska and the Dakotas. The Michigan program has given particular emphasis to the placing
of commercial hatcheries under federal and state supervision for the application of both the tuberculin test and the blood test for pullorum disease. Six hatcheries in that state are now under supervision and local veterinarians have been trained to conduct the test and to see to it that reactors are properly disposed of. The salaries of the local veterinarians are paid out of fees collected from the flock-owners and the hatchery-owners.

The Klager Hatchery, at Bridgewater, Mich., was the first to apply for this supervision, because the tattooing of hogs at Detroit, to trace shipments, disclosed a number of infected flocks in that vicinity. In response to an inquiry from a hatchery in Iowa concerning the value of this supervision, the Klager Hatchery, under date of June 1, 1934, replied as follows:

If this state and federal disease control supervision were a patented process charging us $600 a year, it would be our first expenditure for the hatchery season.

The Michigan plan elaborated by Dr. T. S. Rich, in charge of the federal work of tuberculosis eradication in Michigan, and his associates, both in the federal and state departments, assumes that because of the magnitude of the problem and limited finances, it is desirable to start with the hatchery flocks. Admitting that there may be but little transmission of the disease through the egg, it nevertheless is more important to apply the tuberculin test to standard-bred flocks of pure breeding than to the average farm flocks.

It is generally agreed by all that the less expensive plan of eradicating tuberculosis from a flock that produces eggs for food purposes is to follow the practice of disposing of the entire flock at the end of the first laying year, for a succession of years, until it has been gradually eliminated from the premises. However, there are many standard-bred flocks, selected with great care for heavy-laying attributes, that should be kept for more than one year of egg-production. Under these circumstances, it is desirable to apply the tuberculin test to the entire flock for the reason that older birds show a higher degree of infection and a larger proportion are spreaders of the disease. The testing of these standard-bred flocks also has an educational influence in that the owners of flocks producing eggs for food purposes in the same neighborhoods become interested in getting rid of this disease.

Under the Michigan plan, an expert culler furnished by the hatchery accompanies the veterinarian and the inferior producers are first removed from the flock. Then the blood test is applied, and those that are affected with pullorum disease are eliminated. The tuberculin test is given to the balance of the
flock and the reactors to both tests are slaughtered under federal inspection. Those that pass are sold to certain hotels that are glad to have inspected drawn birds.

I think all will agree that it is very important to apply the blood test, as pullorum disease is the principal cause of high mortality in baby chicks. Flock-owners are less likely to be willing to replace the old flock each year with young chicks if the mortality is high. Regardless of the fact that hens lay approximately one-third more eggs the first 12 months than any succeeding year, this advantage to the owner would be offset if his mortality in baby chicks is high.

In Illinois, a few years ago, the tuberculin test was applied to a very large number of flocks in several counties. This was not confined to standard-bred flocks. It was a rather expensive procedure, but it did furnish valuable data as to the wide prevalence of tuberculosis and that the older birds show a much higher percentage reacting. In this Illinois work, a great many brood sows were also injected, in one ear with the standard tuberculin and in the other with the avian tuberculin. Approximately 97 per cent of these brood sows reacted to the avian tuberculin but not to the bovine.

Work has been done in Minnesota, Wisconsin and Nebraska in certain counties designated for the intensive plan, where the veterinarians make a farm-to-farm survey, applying the test to those flocks that did not show clinical symptoms or did not reveal the disease by postmortem examination. This has given valuable information concerning the general prevalence of the disease and has demonstrated that a much smaller percentage of pullets than older birds react. Furthermore, these contacts with flock-owners, many of whom are unaware of the presence of the disease, have been valuable in influencing them to follow suggestions for its elimination. In nearly all of these counties, the receptivity of the flock-owner has been good. Many are aware that something is wrong with their poultry and are glad to have expert advice.

The intensive farm-to-farm canvass will undoubtedly result in a very great improvement in flock management for the elimination of the disease. Because of the time required at each farm under this plan, the improvement in conditions is necessarily limited to relatively small areas. This will not serve to reduce greatly the losses on hogs as a result of the avian type until a much larger area is covered. Educational work in the form of articles on tuberculosis in the agricultural journals, the wide distribution of bulletins and other general publicity will
have some influence over a wide field. Not all farmers will read this material and not all who read the articles will put the suggestions into practice, but some will, which will relieve the situation to some degree over a large area, making the problem less difficult when later work is undertaken under the intensive farm-to-farm plan.

Standard-bred flocks producing breeding stock or supplying hatcheries constitute less than 10 per cent of the total flocks. When these are given the tuberculin test and the blood test for pullorum disease and when other flocks are disposed of at the end of the first laying year, at least until tuberculosis has been eliminated, conditions in both industries will be greatly improved.

Twenty-five years ago, tuberculosis was probably just as prevalent in the East as in the Middle West. Now the East is comparatively free from the avian type, undoubtedly due to the general practice of keeping pullets only in that section where farms are smaller, where poultry-raising is a major industry, and where more importance is given to economy in egg-production. This same practice with the general farm flocks in the Middle West should give similar results.

In closing, I wish to emphasize as strongly as possible the present trends of the consumers toward foods of unquestioned wholesomeness. The public-health aspects of the cattle program have always been given much emphasis in our appeals to Congress and state legislatures for larger appropriations. One of the striking accomplishments of the cattle campaign has been improved public-health conditions. Statistics compiled from records furnished me by the Division of Vital Statistics, U. S. Public Health Service, show no decline in the human death-rate from non-respiratory tuberculosis preceding 1917, when the national cattle-testing campaign was started—21.4 per 100,000 population in 1900, and 22.5 in 1917. Since then, more than 3,000,000 tuberculous cattle have been slaughtered as a result of the tuberculin test and the human death-rate from non-respiratory tuberculosis has gradually declined to 5.9 per 100,000 population in 1933.

Our poultry industry is seriously handicapped by this situation not only from the viewpoint of the consumer, but also from that of the flock-owner in the matter of economical production. It is perfectly unnecessary, as there is always some solution of a problem of this character. It is for the members of this organization to show the way. I feel sure that we will have the cooperation of the poultry industry in any practical method that will bring the deserved results.
The next is the report of the Committee on Tuberculosis, by Dr. E. A. Crossman, Chairman.

Mr. President, your Committee is not quite ready to report at this time, and we respectfully request a little more time. I think we will be able to make our report tomorrow morning.

Before we start the discussion, I wish to state that at the meeting of the Executive Committee last night I was instructed to appoint a Nominating Committee. I am going to name the following gentlemen to constitute that Committee:

Dr. J. L. Axby, Indianapolis, Indiana
Dr. H. C. Givens, Richmond, Virginia
Dr. H. D. Port, Cheyenne, Wyoming

Now we are ready for the discussion. If you do not care to discuss the subject, the next thing on the program is a special conference on pullorum disease, and I am going to call on Dr. Hubert Bunyea, chairman of the Committee on Transmissible Diseases of Poultry, to explain it.

Mr. President and Gentlemen: I have in my hand a copy of the Code of Fair Competition for the Commercial Breeder and Hatchery Industry, Code No. 8. I would like to call your attention to Article VIII, Section 3, Sub-section 9:

“The coordinating committee shall work out, in cooperation with hatchery and breeder organizations, the United States Department of Agriculture and other interested agencies, and report to the Secretary of Agriculture for his approval at the earliest possible date, and, in any event, within the next year, uniform terms, rules and regulations for flock improvement.”

I call your attention to the fact that this code is dated as issuing on December 27, 1933, and that the request for the information should be in before the twenty-seventh of this present month in order to come within the year.

President Robinson, during October, received a communication from Dr. J. R. Mohler, Chief of the U. S. Bureau of Animal Industry, calling attention to this article, section and sub-section and also to the national program for the poultry industry of the United States which has been brought into existence in response to that article.

We are particularly interested in that part of this national improvement program that has to do with pullorum disease eradication. I am sorry that I do not have copies to circulate among you, but we find on pages 6 to 9 provisions concerning the control of pullorum disease in flocks that are under NRA control.

Dr. Mohler has requested that the President of this Association refer the matter to the Committee on Transmissible Diseases of Poultry, in order that they may make suitable recommendations to the Association, and the Association to the Secretary of Agriculture, through Dr. Mohler.

Unfortunately, only a minority of the Committee on Transmissible Diseases of Poultry is in attendance at this meeting. We have conferred, however, with other men who have specialized along the lines of poultry diseases, and we have about arrived at a conclusion with reference to one phase of the problem.

In order to lead up to that, I will call your attention to a questionnaire that has recently been forthcoming as a result of an investigation by Roberts and Burriss, of Reynoldsburg, Ohio. This questionnaire brings to light a great many interesting facts concerning pullorum disease. One which I want to call to your attention is the fact that there is a considerable variation in the methods of diagnosing pullorum disease in the various states. We find that, out of 41 replies, there
are 20 states using the laboratory test, two states using the rapid serum test, eight states using the stained antigen whole-blood test, two states using the pullorin test, three states using the laboratory tube and the rapid serum tests, five states using the laboratory tube and the whole-blood tests, and one state using the rapid serum and whole-blood tests.

It is obviously hopeless to devise a single plan that will be adaptable to a situation like this. So I say that we committeemen who are present, in conference with others who have specialized along these lines, have come to this conclusion, and I wish to offer it at this time as a motion, Mr. President: That this Association recommend to the Secretary of Agriculture, through Dr. Mohler, that an official test for pullorum disease, for the purposes of Hatchery Code 8, shall be the agglutination test defined as follows:

(a) The tube agglutination test as described in the Proceedings of the United States Live Stock Sanitary Association, November 30 to December 2, 1932, pages 487 to 491; or

(b) The stained antigen rapid whole-blood test as described by Schaffer, McDonald, Hall and Bunyea, in the Journal of the American Veterinary Medical Association, Volume lxxix, New Series 32 (2), pages 236 to 240, and U. S. Patent 1,816,026; or

(c) The rapid serum test as described by Runnells, Coon, Farley and Thorp, in the Journal of the American Veterinary Medical Association, Volume lxx, New Series 23 (5), pages 660-662.

Mr. President, I make that as a motion.

Mr. President I second the motion.

Mr. President: You have heard the motion. What is your pleasure. All those favoring the motion signify by saying "aye"; contrary-minded "no." It is a vote, and it is so ordered.

Mr. President, I might say that there are several other features of the pullorum disease control plan incorporated in this national program that we believe should be reviewed by this Committee, and, inasmuch as only a minority of our Committee is present at this meeting, I am going to make the motion, if you will permit me, sir, that the President appoint a rather sizable auxiliary committee to meet with us in session tonight to consider these other factors in order that, if possible, a report might be arrived at and rendered at the poultry session tomorrow morning.

Mr. President: I don't consider that that requires a vote, Dr. Bunyea. I will appoint the following:

Dr. E. W. Roberts, Ohio
Dr. H. Van Roekel, Massachusetts
Dr. R. E. Lubbehusen, California
Dr. C. E. Cotton, Minnesota
Dr. W. H. Beck, Michigan
to confer with your Committee. Is that a sufficient number?

Mr. President: I think so. Dr. Rettger and I would like to meet the gentlemen named in order that we may take up the further matters pertaining to the pullorum disease control work of the NRA Code, hoping that it may lead to a report tomorrow morning. I believe that takes care of all that we can accomplish at this time.

Mr. President: Is there any further business to come before this session? If not, we will stand adjourned until 9 o'clock tomorrow morning.

. . . The meeting recessed at 3:45 p. m. . . .

RECESS
FRIDAY MORNING, DECEMBER 7, 1934

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

PRESIDENT ROBINSON: This session is devoted to "Transmissible Diseases of Poultry." The first paper, "Environment and Poultry Diseases," is by Drs. L. Van Es and J. F. Olney, of the Department of Animal Pathology and Hygiene, University of Nebraska, Lincoln, Nebraska. I understand that Dr. Van Es is not here, so the paper will be read by Dr. Frank Breed, of Lincoln, Nebraska.

Dr. Breed: Mr. President and Members: I wish to express to you Dr. Van Es' regrets that he was not able to be here. He had made his plans to come and present this paper, but, due to previous illness, it was necessary for him to cancel the engagement in order to protect his own health.

. . . Dr. Breed then read the paper prepared by Drs. Van Es and Olney: . . . (Applause.)

ENVIRONMENT AND POULTRY DISEASES

By L. VAN ES and J. F. OLNEY

Department of Animal Pathology and Hygiene
University of Nebraska, Lincoln, Neb.

Your Committee on Transmissible Poultry Diseases deemed it appropriate that a brief preliminary report be submitted to this Association relating to some observations made by the Nebraska Agricultural Experiment Station during the pursuit of an experimental project entitled, "An Inquiry Into the Influence of Environment on the Incidence of Poultry Diseases."

The primary purpose of this investigation was to measure, if possible, the value of hygienic measures and, second, to gather whatever information may become available on the relation of certain disorders to a given poultry population exposed to their etiologic factors.

In the execution of the investigation, two poultry populations, as nearly identical in character and number as could be procured, were each maintained in a separate environment and there exposed to a given infection. These environments differed in their appointments. In the one, conditions similar to the ones prevailing in farmyards were maintained. There the fowls were in immediate contact with the soil, and food and water were provided in open troughs. An open drain runs diagonally through each yard and its inhabitants had access to it at all times.

In the other environment, sanitary measures, reasonable and not beyond economic possibility, were taken. The yard is covered by a 12-inch layer of coarse gravel, which excluded all accumulation of surface water. The floor of the shelter-house was cov-
ered with wire netting stretched on frames, which later on were replaced by more effective hardware-cloth panels. The food is provided in troughs or self-feeders, closed, although not completely so, to fecal contamination. The drinking water is made available in self-cleaning fountains as devised by the Nebraska Station. In this type of environment, all contact with the soil was broken and fecal contamination reduced to a minimum. To accomplish the latter, some improvements were made from time to time as the investigation progressed.

Other details of management were the same for both environments. The fowls received the same ration, were housed in the same manner, and had the same area per bird made available to them. Whatever cleaning was done was always identical for both houses, and the yards were not cleaned at all. On the whole, cleaning was by no means overdone in order that the test applied to the sanitary measures in use be reasonably severe.

Observations on the influence of environment on morbidity were made on bacillary white diarrhea, blackhead of turkeys, tuberculosis, fowl cholera, coccidiosis, and fowl typhus. In a number of these disorders, the experimental work has been concluded, but in the case of none have the data been sufficiently analyzed to warrant final conclusions. Hence, any statement which may follow in this report is subject to revision and must be accepted as merely tentative.

**Bacillary White Diarrhea**

This disorder was included in the series in order to determine whether or not the infection is transmitted to non-reacting adult fowls from positive reacting ones introduced among them. Should such transmission take place, then it would be considered important to know to what extent the character of the environment exercised an influence. With this in mind, the experimental lots were each populated with a number of non-reacting fowls with the intention of bringing reacting ones among them, after one or more subsequent agglutination tests gave negative results. Each of the two lots was inhabited by two distinct populations of fowls. The first ones occupied the yards from July 29, 1929, to April 4, 1932, and the second ones from May 7, 1932, to January 11, 1934.

The selection of the fowls composing the first populations did not prove to be a fortunate one. They were non-reacting birds, two or three years old, and were obtained from a flock of known freedom of transmissible avian diseases with the exception that
during the latter part of 1926 some bacillary white diarrhea cases among young adult birds were found.

This flock was tested and severely culled prior to the 1927 hatch, and since that time no more losses among chicks were sustained from the disorder mentioned. For several years since, all deaths occurring among brooder chicks had been challenged by bacteriologic examination. In the subsequent annual agglutination tests of the flock, a few reactors were found, however, and these were always promptly eliminated.

The fowls used in the experiment had shown negative reactions shortly before being placed in the lots. Regular monthly tests for bacillary white diarrhea were commenced on October 10, 1929, and continued until the fowls were disposed of in the spring of 1932. It was both surprising and disappointing that positive reactions were obtained in most of the monthly tests although not in all. The occurrence of the reactions was extremely erratic. No fowl reacted constantly during the course of the experiment, although a few of the fowls never reacted at all. Some birds would react positively a month or two in succession, then for a number of months would show negative reactions and later again would react positively once more.

Although it was quite apparent that the original purpose of the experiment was defeated by the presence of manifestly infected fowls in both lots, it was deemed wise to continue the observations as planned. Therefore, on October 27, 1930, about a dozen positive reacting fowls from a badly infected flock were placed in each lot. This was followed by an increased number of reacting birds being revealed by the succeeding two or three monthly tests. Afterward positive reactions continued to show up at about the previous rate.

Between April 14 and November 20, 1931, the practice of removing all reactors after each test was followed. This resulted in a decrease of the incidence of positive reactions, although by no means a conspicuous one. The monthly test of December 15, 1931, revealed no positive reactions but the test of January 16, 1932, when only 36 and 38 fowls were left, revealed the highest percentage of positive reacting fowls as yet encountered in the course of the experiment. The latter was discontinued after the test of March 19, 1932.

Without burdening this preliminary report with further details, it was tentatively concluded: (1) That it was a tactical mistake to select mature birds from a flock where, a year or two before, the disease had occurred even if at the time they showed negative blood titres. (2) That because of there being
no substantial difference in the reaction incidence among the fowls of each lot, it seemed evident that the latter was not associated with purely environmental factors. (3) That the habit of eating practically every egg laid in both yards, which developed as a conspicuous feature from the very beginning, could be held accountable for the peculiar reaction behavior of both flocks.

Taking this lesson to heart in connection with the second populations, the birds selected were chicks four weeks old, which had been brooded in a sanitary manner and among which no cases of bacillary white diarrhea had occurred. These were placed in the lots, May 7, 1932, and left there undisturbed until September 13, 1932, when the first agglutination tests were made. Monthly tests were continued until December 21, 1933, when the experiment was concluded.

On February 21, 1933, reacting fowls, eight in number, were introduced in the lots. Egg-eating was completely prevented throughout the experiment by the use of trap-nests. During the entire period, only one positive reaction was obtained (May 19, 1933), the bird concerned reacting only once. Practically all the reacting fowls introduced on February 21, 1931, continued to react positively until the conclusion of the experiment. Thus no evidence of environmental or direct contact infection was encountered in either lot when infection-free fowls were exposed to infected ones and when egg-eating was effectively prevented.

BLACKHEAD IN TURKEYS

The lots in which the environmental influence on the incidence of blackhead was observed, were arranged and equipped in conformance with the ones already described. However, during the last two seasons of the five-year period here reported, hardware-cloth panels were placed on top of the gravel in the sanitary lot. This change was made primarily because in the course of previous years an increasing number of poults succumbed to impaction of the gizzard by pieces of gravel too large for exit. It was also deemed proper to obtain data on the use of wire panels in environments where young turkeys were being maintained.

Before the beginning of the experiment, blackhead infective material was introduced in each lot in equal manner and volume. Aside from an occasional repair of defects, the yards received no further attention in the way of cleaning, etc. The shelter-houses were cleaned from time to time, but this was never overdone. After the removal of the turkeys each autumn, the lots
were left as they were and no further infective material was introduced into them. The lots were left unpopulated between the middle of November and the middle of June of the year following.

The poults used in the experiment were hatched in an incubator and brooded under stringent sanitary protection. They were placed in the lots when they were four weeks old and always received identical care as well as food and water. The only difference in the maintenance pertained to their environments and the manner by which food and water were supplied. Results noted during the five-year period of the experiment here reported are shown in table I.

**TABLE I—Blackhead morbidity among poults during uninterrupted occupancy of yards.**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SANITARY YARD</th>
<th>FARM YARD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POULTS</td>
<td>BLACKHEAD CASES</td>
</tr>
<tr>
<td>1929</td>
<td>102</td>
<td>6</td>
</tr>
<tr>
<td>1930</td>
<td>151</td>
<td>151</td>
</tr>
<tr>
<td>1931</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>1932</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>1933</td>
<td>130</td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>483</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

It is apparent that in experiments pertaining to the factor of environment on the transmission of blackhead in turkeys, the morbidity rate in a reasonably sanitary yard in the course of five annual periods of approximately five months each ranged between 0 and 6 per cent and that in the insanitary environment, during the same time, the rate of sickness from blackhead fluctuated between 26.36 and 84.1 per cent of the fowls maintained in the lots.

When average morbidity rates are considered, the proportion of blackhead cases arising in the sanitary lot and the imitation farmyard is as one of 1: 14.77. The results, as well as certain observations to be reported later, sustain one in the belief that it lies not beyond the range of possibility to create, within economic boundaries, an environment from which blackhead hazards can be entirely eliminated and wherein the disease, if introduced, cannot be propagated. Experiments are now under way with a view of testing the validity of such a hypothesis.
TUBERCULOSIS

The studies pertaining to the incidence of fowl tuberculosis were carried on in two lots of a nature similar to the ones already described in connection with other diseases. Both yards were populated with an identical number of fowls always obtained from a tuberculosis-free flock. Infection was introduced among the two populations by means of birds either inoculated intravenously or infected by the ingestion of fresh avian tuberculous material obtained from the field. As the population became reduced by mortality from all causes, birds were periodically recruited by new purchases and an attempt was made to keep both yards, as nearly as possible, at the same density of population.

The part of the investigation having to do with avian tuberculosis has not been finished and it has not yet been possible to ascertain the net results. Yet, the trend of observations thus far made indicates what the latter may approximately turn out to be. Indications are not lacking which seem to show that a given environment may be either salubrious or insalubrious, without greatly modifying the incidence of avian tuberculosis after the latter has once been introduced.

For, as far as the experimental evidence already obtained indicates, it appears that the longevity of the tubercle bacillus in an extra-corporal situation, largely overcomes whatever advantage may be associated with sanitary efforts. The tuberculosis morbidity has until the present failed to show a significant difference in favor of the cleaner environment. That the latter had its advantages was shown only by its favorable influence on the mortality from intercurrent causes. It required more fowls to maintain the population of the less sanitary yard at a desired level of density than in the one where reasonable sanitary conditions prevailed.

Certain observations of an epizootologic character are of interest. In the course of the years 1929-1932, both yards were populated with mature birds, usually more than two years old. Such fowls, as a rule, became promptly tuberculous when artificially infected. Yet in spite of a rather intense exposure, the older birds, which contracted tuberculosis by either direct or environmental contact, were quite small in number.

Of the 333 mature fowls exposed in the sanitary environment, only nine (2.7 per cent) have thus far succumbed to tuberculosis or were found to be tuberculous after dying from other causes. In the less salubrious one of the two yards, the results were
quite similar. Of the 313 mature fowls populating this lot, only six (1.91 per cent) became tuberculous. These results seem to indicate that after a fowl attains the age of two years or more without previously contracting tuberculosis, the chances of it doing so when placed in an infected environment are fairly remote.

After it became apparent that the original adult stock as well as the mature fowls placed in the lots to maintain the desired population density showed such a high degree of resistance to natural exposure, it was deemed wise to use younger birds for recruiting purposes. This plan has been followed since 1932. In time, the conspicuous difference between the susceptibility to natural exposure to tuberculous infection of older and young fowls became apparent. Thus, of the 274 young fowls exposed to tuberculous infection in the more sanitary of the two yards at the age of from eight to ten weeks, 40 birds (14.6 per cent) either died of tuberculosis or were found to be tuberculous when they succumbed to other causes. The results obtained in the non-sanitary yard were almost identical. The 374 young fowls introduced into this yard thus far developed 54 cases (14.43 per cent) of tuberculous disease.

Fowl Cholera

In the sections devoted to the influence of environment on the morbidity of fowl cholera, the method pursued did not differ materially from the one followed in connection with tuberculosis. In the lots arranged like the ones already described, populations of mature birds were introduced and there left undisturbed for a period of 40 days in order to make certain that no intercurrent infections had to be reckoned with.

For the introduction of infection, dependence was almost entirely placed on the intravenous inoculation of a suspension of virulent rabbit blood, of an equal number of fowls taken from each yard. It must not be thought, however, that an outbreak could always be inaugurated by this mode of procedure. Apparently the instability of the pathogenic qualities of this type of microorganisms was also encountered in the execution of this experimental project.

The actual experiment was begun August 15, 1929, and was terminated August 15, 1932. During the period indicated, two distinct populations occupied each yard with a period of two weeks intervening, during which the yards remained depopulated. In each of the two populations a rather typical outbreak
of fowl cholera could be studied. The first one especially showed all the characteristics of the more common form of farm outbreaks. In each of the two yards, six recently infected fowls were introduced. These birds succumbed to acute cholera within 24 to 48 hours, their deaths being followed within 24 hours by an outbreak of classical quality.

Deaths were numerous for a period of 12 to 14 days and after this the heavy mortality ceased. However, more or less sporadic cases continued to occur at a declining rate for a period of about eight months until the original population density was reestablished by new purchases. Within two to ten days after the introduction of the newcomers, the disease flared up again with a considerable degree of intensity, involving both the recently obtained fowls as well as the ones which survived the previous exposure.

The second populations of the two yards began to be assembled on October 28, 1930, after they had been vacant for about twelve weeks. While this was progressing, three cases of fowl cholera developed in the sanitary yard and one case in the less salubrious one. Apparently the infection source of these cases was a purely environmental one, the microorganisms surviving during the colder winter weather.

By the latter part of June, 1931, the desired density of population had become established and infected fowls were introduced into the lots. This failed to inaugurate an outbreak, only one contact case developing in one of the lots. A similar attempt was made again on October 4, with the same results. However, when the effort was repeated on October 8, outbreaks were started in both yards. These outbreaks were distinguished from the ones observed in the first populations by being of a less explosive nature and by a shorter duration.

The fowls were removed from the lots on May 31, 1932, and apparently no environmental infection remained inasmuch as a number of geese introduced into the lots two weeks after they were abandoned failed to sicken during a sojourn of about six weeks.

The results obtained seem to warrant the conclusion that if the character of environment exercises any influence on fowl cholera morbidity at all, it is greatly overshadowed by the intensity and virulence of direct contact infection, which, in the experiments here related, accounted for the sudden, even more or less explosive outbreaks which followed the introduction of infection in the sanitary as well as in the non-sanitary environments.
Coccidiosis

The general equipment of the yards devoted to the study of coccidiosis in different environments was in conformance to the one available in the lots where other diseases were studied. However, after the experiments had advanced to a certain point, hardware-cloth panels introduced into the sanitary yards constituted a deviation from the original plan of procedure.

Both yards were infected on May 21, 1929, by first scattering over the surfaces an equal quantity of earth containing an abundance of oöcysts and, second, by introducing into each lot 25 chicks suffering from coccidiosis. On May 27, 1929, an additional 18 chicks affected by the disease were added to each lot. All these chicks died within four weeks.

On June 3, 1929, each yard was populated with 107 chicks eight weeks old. Of these, only one chick died of coccidiosis in each environment. On the other hand, when the chicks were killed and examined on October 30, 1929, a marked majority were found to be infested with coccidia, regardless of the yard from which they were taken.

The yards remained uninhabited between November 1, 1929, and May 28, 1930, when 125 chicks four weeks old were introduced into each lot. Of these, three chicks from the sanitary environment and eight chicks from the insalubrious one died of coccidiosis up to July 29, 1930, when both flocks were disposed of to make room for younger chicks.

On August 3, 1930, each lot received 86 chicks four weeks old. During their sojourn in the yards, which terminated October 7, 1930, no deaths from coccidiosis occurred in the sanitary lot and only two deaths from the disorder could be recorded for the less salubrious environment. When the chicks were killed and examined it was found that about 47.5 per cent of the inhabitants of the sanitary lot were infested by coccidia against 24 per cent among the chicks taken from the less sanitary one of the two environments.

The yards remained unpopulated between October 7, 1930, and February 4, 1931, when 30 mature fowls were introduced into each of the lots, in order to make certain that coccidial infection would be maintained and also because at the time it was considered advisable to imitate the conditions prevailing in the average farm poultry yard. These fowls were removed from the yards on April 10, 1931. The latter remained uninhabited until April 29, 1931, when 129 chicks, four weeks old, were introduced into each yard. As occasion presented itself, one chick
affected with coccidiosis was placed in each lot on May 29, 1931, and June 1, 1931, respectively.

Of these populations, 17 chicks of the sanitary lot and six of the non-sanitary one either died of coccidiosis or were, upon postmortem examination, found to be the carriers of a conspicuous number of oöcysts. The lots were vacated on August 7, 1931.

On August 11, 1931, each of the two yards was again populated by 103 chicks, four weeks old. Further additions to each yard were made August 17, 1931 (10 chicks), May 5, 1932 (111 chicks), May 21, 1932 (117 chicks), July 20, 1932 (177 chicks), and September 13, 1932 (61 chicks). From August 11, 1931, to May 5, 1933, all chicks reaching the age of 8 to 10 weeks were removed from the yards. During the period mentioned, 84 deaths from coccidiosis occurred in the sanitary yard and 54 deaths from the same cause in the one where no attempt at sanitation was made.

The results obtained between May, 1929, and May, 1933, revealed the fact that the chances of chicks dying of coccidiosis were somewhat greater in the yard regarded as reasonably sanitary than in the one which could be qualified as quite insalubrious. No doubt, the sanitary protection provided in the one yard was entirely inadequate in the face of a coccidiosis hazard and it may even be suspected that, with the equipment provided, the chances of the chicks contracting the disease had become enhanced.

As it was quite apparent that fecal contacts were not sufficiently broken, an attempt was made to apply corrective measures. Hence, the yard and shelter-house floor of the more salubrious environment were covered with one-inch-mesh, hardware-cloth panels, before the first populations of the year 1933 were introduced into the yards. This was done on May 7, 1933, and on May 10, 1933, each yard received 247 chicks, five weeks old. Other additions were made as follows: 50 on May 25, and 25 each on June 2, June 3 and June 5, respectively. These chicks were from four to six weeks old. All surviving chicks were disposed of on July 17, 1933. In the sanitary yard, 16 deaths from coccidiosis were recorded and 95 deaths from the same cause occurred in the less salubrious of the two yards.

On July 17, 1933, the yards were again populated, this time 253 day-old chicks each, to be brooded in the shelter-houses. On July 26, 1933, 77 additional chicks, one week old, were added to each yard. When the chicks were from two to three weeks old, they were allowed to go into the yards, weather permitting.
The brooder stoves were removed when the chicks were about four weeks old. On September 12, 1933, all surviving chicks, then 57 days old, were removed from the yard. Of the two populations, 30 chicks had died of coccidiosis in the sanitary yard and 140 chicks had succumbed to the disorder in the less salubrious environment.

On September 13, 1933, each yard was repopulated by 182 day-old chicks, which were cared for in a manner similar to the one employed for the preceding groups. When a disastrous raid by rats in the house belonging to the insalubrious yard caused a marked discrepancy in the two populations, the balance was restored by transferring 53 chicks from the sanitary lot to the one in which the chicks had been killed. The populations of the two yards were maintained until March 24, 1934, when both yards were vacated until April 7, 1934. During the period which terminated on the latter date, no losses from coccidiosis had occurred in the sanitary lot and 19 chicks had succumbed to that disease in the insanitary environment.

The results observed in the course of the 1933 experiments indicate that the sanitary inadequacy of the alleged salubrious yard had been markedly removed by the use of hardware-cloth covering of the shelter floor and yard surface. However, the number of chicks which died of coccidiosis in this lot indicated that all infectious contacts had not yet been broken. Closer inspection revealed the fact that the fecal contacts were made on the tops of the feeders used in the environment concerned. Although the feed contained in them was fully protected against contamination, the birds could deposit their droppings on the covers of the self-feeders and a bit of watching soon showed that the chicks would actually ingest this sort of material. Repeated microscopic examinations of the latter always revealed sporulated oocysts.

In order to eliminate this source of mischief, special types of feeders were designed and constructed. This part of the experimental program has not yet been completed, although the principal objective has apparently been achieved. (Some of these feeders are illustrated in the Nebraska Agricultural Experiment Station Bulletin 290.)

The results of the 1934 experiments were particularly marked by a relatively low rate of coccidiosis mortality among the chicks exposed. This phenomenon was attributed to the excessive heat and drouth which prevailed throughout the entire season during which the experiments were carried on. Hence, it appeared advisable to base conclusions not only on mortality but also to take
account of the degree of coccidial invasion manifested in each population.

On April 7, 1934, each yard was populated by 334 chicks four weeks of age. They were removed from their respective environments on May 22, 1934, with the exception of 50 chicks, which were transferred from the sanitary lot to the insalubrious one, and of another 50 chicks which were permitted to remain in the sanitary yard.

Among the chicks constituting the first 1934 populations, none died of coccidiosis in the sanitary yard and, of the 126 chicks killed between May 7 and May 23, 1934, not a single bird showed coccidia upon microscopic examination of the contents of both the cecums and of the duodenum. In the non-sanitary lot, only three chicks died of coccidiosis and, of the 143 chicks examined after being killed, all were carriers of oocysts with the exception of three. Of the 50 chicks which had been permitted to remain in the sanitary yard, 48 were killed on June 26, 1934, and none were found to reveal evidence of coccidia upon examination. On the other hand, of the 47 chicks which were part of the ones transferred to the non-sanitary environment, all showed some degree of coccidial invasion.

The second 1934 populations of 312 four-week-old chicks entered their respective environments on May 23, 1934. They remained there until July 9, 1934. None of the chicks inhabiting the sanitary yard developed coccidiosis during the period of occupancy and, of the 189 chicks examined postmortem between June 25 and July 10, 1934, only one revealed a single oocyst only. Among the corresponding population of the insalubrious environment, there occurred 12 deaths from coccidiosis and, of the 264 chicks examined after death, every one showed some degree of coccidial invasion.

The third 1934 populations consisted of 432 chicks each, which were introduced in their respective environments as day-old chicks on July 11, 1934. They remained there until September 19, 1934. Among the group occupying the wire-covered lot, no deaths from coccidiosis occurred and, of the 236 chicks examined postmortem between September 4 and September 19, 1934, 20 chicks showed some degree of coccidial infestation. This may be accounted for by the fact that at the beginning of the experiment, from 15 to 25 chicks were found to have managed to get under the wire where they remained for not more than six hours.

The chicks inhabiting the less salubrious environment sustained a coccidiosis death-loss of 24 birds and, of the 392 chicks
examined after death, between September 4 and September 19, 1934, only 12 birds were found to be entirely free from coccidia, the remaining ones all showing some degree of infestation.

The evidence obtained from the 1934 experiments indicates that, although coccidiosis is perhaps the most difficult poultry disease to prevent, the use of certain types of equipment places effective prophylaxis within the range of possibility.

**Fowl Typhus**

The experiments pertaining to fowl typhus were conducted in accordance with the general plan followed in connection with the ones concerning the diseases previously mentioned and in environments identical to the ones adopted in connection with the latter. The yards were populated with identical numbers and nature of fowls procured from flocks known to be free of any communicable disease. At suitable times, fowls either inoculated with *Bacillus gallinarum* or infected with infective organs were introduced into the yards and the results recorded. However, the method followed did not always result in the inauguration of manifest outbreaks. Apparently a substantial proportion of fowls is quite resistant to direct or indirect contact infection. The following is an account of the pursuit of the investigation:

On October 15, 1929, each environment was populated by 100 healthy adult fowls and on October 17, 1929, six fowls were introduced into each yard after they had been inoculated with a *B. gallinarum* culture. Up to August 12, 1930, two of the inoculated birds and two of the contact fowls died of typhus in the sanitary environment. In the less salubrious yard, three inoculated fowls and five contact birds died of the same disease during the period mentioned.

On August 12, 1930, ten fowls, which had been fed with typhus material obtained from a field case, were introduced into each yard. During the period which terminated on February 17, 1931, two of the artificially infected birds died of typhus in the sanitary environment, but no deaths from this disease were recorded among the contact birds within this space of time. In the course of the same period four inoculated birds and one of the exposed fowls succumbed to typhus in the less sanitary one of the two lots. Apparently the subjects used in the experiment showed a rather marked resistance to typhus infection. It was thought to be probable that the factor of age may have been accountable for this phenomenon and hence the populations concerned were disposed of.
Both yards were depopulated on February 17, 1931, and left undisturbed until June 8, 1931, when both environments were sprinked each with 1,000 cc of a 48-hour bouillon culture of *B. gallinarum*. On June 18, 1931, each yard was again populated by 117 healthy chicks, nine weeks old, and on June 20, 1931, three chicks of each lot were inoculated and three birds were fed with a culture of the fowl typhus bacillus and returned to their respective environments. During the period which terminated on September 2, 1931, three of the artificially infected fowls died of typhus and no deaths due to the disorder occurred in the more sanitary of the two environments. In the less salubrious of the two yards, two of the inoculated birds and two of the exposed ones died of typhus during the same period.

On the last date mentioned, six additional fowls, infected in a manner similar to the one employed on June 20, 1931, were introduced into each yard. Between September 2, 1931, and April 4, 1932, four of the artificially infected birds and three of the contact, died of typhus in the more salubrious of the two environments. In the insanitary yard, two of the artificially infected fowls died of typhus and a rather typical outbreak of the disease could be recorded among the exposed chicks, 39 of the latter dying of the disease.

The populations of both yards were disposed of on April 4, 1932, and the lots kept unpopulated until May 20, 1932. On that date, 160 chicks, four weeks of age, were introduced into each environment and on June 21, 1932, six chicks of each lot were inoculated with the fowl typhus organism and returned to their respective environments. This was repeated on July 9, 1932, as no typhus had developed in any of the fowls previously infected. Between July 9, 1932, and August 31, 1932, three inoculated fowls and three contact birds died of typhus in the more salubrious of the two lots, whereas in the other environment three deaths from typhus could be recorded among the inoculated birds and no deaths from typhus occurred among the contact fowls. On August 31, 1932, six new fowls inoculated with virulent cultures of *B. gallinarum* were introduced into each yard. By September 28, 1932, two inoculated birds in each yard had died of typhus, but no deaths from that cause could be recorded among the contact fowls.

On the last date mentioned, six new chicks were inoculated and introduced in each of the yards. On January 27, 1933, 63 cockerels from the sanitary yard and 44 cockerels from the less salubrious one were disposed of on account of their disorderly behavior. On February 4, 1933, these birds were replaced by
equal numbers of adult, healthy pullets. Between June 1 and
June 6, 1933, an additional 61 chicks, five weeks old, were in-
troduced into each environment. The experiment was closed on
October 9, 1933, when all survivors were disposed of. Between
September 28, 1932, and October 9, 1933, when the experiments
terminated, deaths from fowl typhus involved three artificially
infected birds and two contact fowls in the sanitary environment
while in the less salubrious of the two lots three inoculated birds
and 22 of the contact fowls succumbed to the disorder.

Summarizing the results obtained in the experiment, a total
of 80 fowls died of typhus in both yards, ten deaths occurring
in the sanitary environment and 70 deaths being recorded in the
less salubrious of the two yards. The conclusion seems war-
ranted that the incidence of fowl typhus, under controlled con-
ditions, is largely influenced by the character of the environment
in which the fowls concerned are being maintained.

MISCELLANEOUS OBSERVATIONS

The absence of disease transmission between yards: The ex-
perimental yards were so arranged that the sanitary lots did
not adjoin the insalubrious ones. The yards of each group
were separated from one another by ordinary wire netting. This
seems to be a rather slender barrier against transmission of in-
fection from one lot to the ones next to it. Yet, in spite of the
fact that, during the warm season, flies were numerous within
the experimental enclosures and that flying birds occasionally
managed to squeeze through the netting, no evidence was en-
countered to indicate that the poultry wire was not an effective
barrier.

The only instance in which a disease apparently escaped from
the environment in which it belonged could be entirely attributed
to faulty judgment. After an outbreak of fowl cholera had ap-
parently terminated in the lots set aside for the study of this
disease, it was deemed expedient to make use of the surviving
fowls to recruit the population of lots in which another disease
was under observation. As a measure of safety, these fowls
were removed to a clean stable on October 10, 1930, and kept
there until October 28, 1930. During the 18 days of isolation,
all these birds remained in good health and it appeared to be
quite safe to make use of them as intended. All went well until
November 25, 1930, when one of the transferred fowls died of
cholera. More cases developed and between the date mentioned
and January 17, 1931, when all the fowls were disposed of, 19
birds had succumbed to cholera. Nine of these were transferred
fowls, eight belonged to the original inhabitants of the lot and two could not be identified because they had lost their leg-bands. It was not until sometime later that the cause of this outbreak, latent infection, could be successfully demonstrated.

**Gravel for poultry yard surfacing:** Although it was recognized that the covering of poultry yards with a thick layer of coarse gravel could not find a wide application in poultry husbandry, there were reasons to believe that its use may materially contribute to the salubrity of a given environment. This proved to be quite true in the case of certain diseases of which the etiologic factors were rather fragile when not protected by a suitable ambient medium. In the experiments related above, this was apparently so with fowl typhus and blackhead of turkeys, diseases against which the gravel in the yards supplied a marked degree of protection. On the other hand, in the case of such disorders as tuberculosis and coccidiosis, of which the causative organisms are quite resistant to external influences, the graveled surfaces apparently afforded no protection at all.

It may be of interest also to mention here that on some of the hottest summer days, the surface temperature of the gravel was about 16° F. higher than that of the surface of the soil in the corresponding yards. It seems even possible that on some days the temperature of the gravel surface may have attained a height lethal to some of the more delicate microbic causes of disease.

**Wire panels in poultry sanitation:** The use of hardware-cloth panels proved to be an important factor in the prevention of fecal contacts and, for the protection of young chicks or poults, it has, no doubt, a place in sanitary management. Hardware-cloth panels of one-inch mesh were successfully used in brooder-rooms for chicks and poults after they had reached the age of two weeks, even if it occasionally happened that very small chicks managed to get under the wire. On the other hand, the metal yard covering as used in experiments appears to be less suitable in yards where a poultry population has to be maintained the year around. In the course of a rather mild winter, common fowls kept in a wire-covered yard suffered materially from frozen feet, a disadvantage from which the inhabitants of the corresponding dirt yards were entirely exempt.

In a more recent experiment concerning the prophylaxis of blackhead, not reported in this paper, about 140 turkeys were maintained on a wire-covered area of 2,400 square feet in which the panels were supported about two feet above ground by 2"x4" stringers. There was a slight sagging of the panels about the time the turkeys had reached a considerable size. When con-
sideration is given to the fact that the individual weights of the birds ranged between eight to 20 pounds, this can scarcely cause surprise.

No damage to the feet of fowls or poults could be attributed to the wire covering of yards, although some of the heavier turkeys, when ready for market, showed callosities of the feet which had a tendency to fissure. This can probably be attributed to the impact caused by the birds flying down on the wire surface from rather high perches.

... Dr. C. C. Hisel, First Vice-President, assumed the chair. ...  
CHAIRMAN HISSEL: Thank you, Dr. Breed.

Dr. Rettger is desirous of getting away and has a report he wishes to make at this time. So we will digress from the program and ask Dr. Rettger to make his report.

DR. RETTGER: Mr. Chairman, I am sorry Dr. Bunyea would not assume this office. He was to submit the report of the Committee at the end of the session.

This is a special report. Briefly, it is largely the outcome of more or less agitation, you might say, in some parts of the country, regarding the likelihood of uniformity both in methods used for pullorum diagnosis and in the carrying out of methods that have already been fully described and one of them fully standardized and approved by this Association, as you know.

There is such a lack of uniformity that hardly any two states or even any two sections of some states carry out the same method in anything like the same way. It would be impossible to get anywhere in the discussion, in a group like this, at least in procuring any solution.

Our Committee deemed it, perhaps, most practical not to attempt to solve the problem among ourselves but to devote our attention to the revised code or rather the plan that is known as the breeder-hatchery plan, as far as poultry production is concerned, of which we had preliminary copies, which will come up before long for serious consideration, perhaps final consideration, by the coordinating committee and perhaps the committee from this Association. I don't know what the final plans are in regard to that.

But our Committee felt that we should report this morning our reaction to this plan as we had it in preliminary, printed form, and make such suggestions and changes in the plan as our Committee agreed should be made.

The regular Committee on Transmissible Diseases of Poultry were not represented here by a majority. There were only Dr. Bunyea and myself out of five members of the Committee. The President of the Association added to this minority membership three members from the Association to meet with us, and they met with us, so that the Committee was made up of five members. We had the good fortune of having with us representatives from the breeder-hatchery associations and persons who would be very close to the final disposition, I dare say, of the present, proposed breeder plan.

We are not presenting this report as an official report of any committee or any combined committee. Our Committee of the Association here is only the regular committee, we dare say. We have no authority to go directly to the coordinating committee or to the powers in Wash-
ington and make these suggestions. They are made only to this
Association. At the end of my talk I shall present a resolution or a
motion as to what disposition might possibly be made of this report.

It is a plan that covers some three or four closely typed pages. I
know that you would not care to have us read this plan as far as it
relates to pullorum testing and pullorum control and pullorum eradi-
cation. I shall touch on just a few things, unless you desire to know
more definitely regarding different phases of this plan and the reaction
of our Committee to the plan, or those phases.

Those of us who were here yesterday will remember that the Asso-
ciation voted on the recommendation of Dr. Bunyea and myself as
present members of the Committee on Transmissible Poultry Diseases.
It was as follows:

. . . Dr. Rettger read the recommendations. . . . (See page 388.)

Dr. Rettger (continuing): This is a recommendation to the Asso-
ciation, but we are assuming that, when the proper time comes, the
Association, through the President, would make this recommendation
to the proper authorities.

These are three methods that were recommended by those of the
Committee who were here. I think it is only right to say that, in our
recommending this and the Association at its meeting yesterday
approving it or voting favorably on it, it does not imply, by the very
fact they were recommended and approved, that they are all standard
methods, but we have to have some working plan. These three meth-
ods were presented because it seems they have the widest distribution in
published literature and the widest application. We do not want to try
to set ourselves up as being arbitrary in selecting methods, but at
the same time it does seem as though we should do something that
will further the interests of the poultry industry in this respect and
will bring about the least bit of opposition and controversy, I dare
say, generally, so as to outstrip this plan and its going into actual,
practical existence. I thought it was no more than right to make that
explanation.

Some of you have seen or heard of some changes that have been
made in last year's Code with regard to terminology. The following
changes have been recommended, and I dare say our Committee last
night, with the favorable advice of the three hatcherymen who were
here, all seemed to be agreed that this change in terminology should
be recommended to the higher authorities, or at least should be
approved. The changes are as follows:

For "Pullorum Tested" the new terminology is the same, "Pullorum
Tested."

For "Pullorum Free" the new provision is that the term "Pullorum
Passed" be used, being synonymous with what we have had in the
past, the term "Pullorum Free," and that for "Pullorum Accredited"
the term "Pullorum Clean" be used in the breeders' plan and, if the
Code continues to be in existence after next July, of course, in the re-
vised and adopted Code.

That covers that phase. That is the terminology in so far as the
name applied to any given flock that has been under supervision and
test and under which name such flocks should be officially known.

As I say, the plan here covers some three or more typewritten pages,
deals with incubation, brooding, advertising of stock, the protection of
the owners against faulty and improper advertising and so on. Of
course, our Committee was particularly interested in all that bears
directly on the test and the uniform application of the test and the
application of the results that come from the test in the control and
ultimate eradication of poultry disease.
I believe I can say that our Committee felt that the real goal should be eradication. We appreciate that that is a difficult undertaking, but we feel at the same time that plenty of experience has already been gained in some sections of the country, over a period of years, which experience should have some significance that eradication may and can be successfully attained under the proper system of sanitation, supervision, and so on, of poultry flocks.

DR. BUNYEA: Mr. President, I move that the report which Dr. Rettger has rendered be adopted and that the Secretary of this Association be requested to forward a copy of the same to Dr. Mohler for this information and official use.

DR. WARD GILTNER: Mr. President, I second the motion with the proviso that, as far as Michigan is concerned, the testing by the whole-blood rapid method will be done according to the technic outlined in a paper entitled "A Field Test for Pullorum Disease," by D. R. Coburn and H. J. Stafseth, printed in Volume lxxix, New Series 32 (2), of the Journal of the American Veterinary Medical Association, August, 1931, pages 241-243.

We have been using this test for the last three or four years and have tested over 200,000 birds with it, and 100,000 will be tested this year. That is the test that Michigan will use. If the U. S. Live Stock Sanitary Association has any objection to that, I would like to have them register it now; otherwise, we will understand that that is official.

DR. BUNYEA: Mr. President, I do not feel that Dr. Giltner has seconded my motion. He has offered an amendment to which I object.

DR. MILLER: As I gather from Dr. Rettger's remarks, this Committee is making some recommendations. Is that a fact?

DR. RETTGER: To the Association, that may be used later on, if they wish.

DR. MILLER: I move that the report be referred to the Executive Committee.

CHAIRMAN HISEL: As a substitute for all pending motions, Dr. Miller moves that the report go to the Executive Committee for approval. Then, Doctor, the recommendations you have requested will be carried out.

Do I hear a second to Dr. Miller's motion?

DR. AXBY: I second the motion.

CHAIRMAN HISEL: Is there discussion?

DR. GILTNER: Mr. Chairman, the statement which I made is on record, I believe, officially.

CHAIRMAN HISEL: Yes.

DR. GILTNER: It would please me very much if that could be referred to the Executive Committee. My announcement, however, stands, that, in the absence of any objections we shall use this method, and, I might say also, in the presence of any objection, we shall also use it.

CHAIRMAN HISEL: Are you ready for the question? All in favor signify by saying "aye"; contrary "no." The ayes have it and the motion prevails.

The next paper will be given by Dr. John B. Nelson, Department of Animal and Plant Pathology, Rockefeller Institute for Medical Research, Princeton, N. J. The subject is "Uncomplicated Fowl-Coryza."

... Dr. Nelson read his paper. ... (Applause.)
UNCOMPLICATED FOWL-CORYZA

By JOHN B. NELSON, Princeton, N. J.
Department of Animal and Plant Pathology
Rockefeller Institute for Medical Research

NATURE OF THE DISEASE

For the past few years, the attention of several laboratories has been focused on an upper respiratory tract infection of the domestic fowl. This disease is essentially a nose cold, being characterized by an inflammation of the nasal passages and the communicating portions of the orbital tract. The chief symptom and in many cases the only symptom is a discharge from the nares. The disease is known by a variety of names. In the older literature it was generally referred to as catarrhal roup. More recently it has been called contagious catarrh, infectious rhinitis, and uncomplicated fowl-coryza. I introduced the latter term, which is admittedly cumbersome and not strictly accurate, as a convenient means of pointing out that the disease is an entity and to be differentiated from the coryzas which may accompany laryngotracheitis, fowl-pox, and fowl cholera. The desirability of adopting a specific name is apparent.

EXPERIMENTAL TRANSMISSION

The disease is readily transmitted to susceptible fowl by the intranasal injection of exudate removed from the upper air-passages of naturally infected birds. The injection may be made by way of the palatine cleft or the nares. Once the disease is initiated in susceptible fowl it may be maintained for a long period of time by the subsequent bird-to-bird passage of exudate. A strain that I have under observation at present was originally secured in October, 1933, and has been carried on to date by making fresh passages at intervals of two to four weeks. There is no indication that the continued passage, conducted for over a year, has had any degrading effect on the virulence of the infective agent.

In the injection of susceptible birds with exudate secured from field cases, I have encountered several types of coryza. Two of these show sharply contrasting incubation periods, designating as the incubation period the time which elapses between injection and the appearance of a nasal discharge. In one case the onset of symptoms is rapid, a nasal discharge appearing on the first to the third day after injection. In the other case the onset of symptoms is prolonged, the duration of the incubation period
varying from nine to 27 days, with a mean of about 14 days. These two types of coryza have been maintained in susceptible fowl over a year. The injected birds are held in separate units under rigid quarantine measures. The experiment birds are drawn from a disease-free stock that has been maintained at the Rockefeller Institute for a number of years. It is quite impossible to explain the difference in the onset of these two coryzas on the basis of individual differences in the susceptibility of the birds employed. The duration of symptoms, while subject to considerable variation, is prolonged in both cases.

The coryza of rapid onset is apparently the more commonly encountered type and is the one that has recently been studied in this country and abroad. Unless otherwise specified, it is the type I shall refer to in the following discussion.

Birds which are experimentally infected by the intranasal injection of exudate usually continue to show a nasal discharge for at least two months. In some cases the discharge may persist for six months and in one bird, which I had under observation, it lasted for 18 months, in fact was still apparent when the bird was finally killed.

CHARACTERISTICS OF THE DISEASE

For the first few days of the disease the nasal discharge is often watery, tending to moisten the bill, and sometimes actually dropping from the nares. It may be either unilateral or bilateral. As the disease progresses, the discharge becomes viscid, definitely mucopurulent in nature, and tends to collect in the nares partially or entirely occluding them. In cases which have persisted for a long time the nasal discharge may contain small yellowish particles of a cheesy consistency and possess an offensive odor.

At autopsy, the nasal passages regularly contain a large volume of semifluid exudate, which for the first few days may be relatively poor in cells, composed largely of mucus. Later it contains large numbers of leucocytes and varying numbers of tissue cells. Red blood-cells are inconspicuous. It may be said that the nasal passages of normal birds contain so little mucus that it is difficult to remove any with a pipette. In birds affected with coryza as much as half a cubic centimeter of exudate may be aspirated. There are no conspicuous changes in the mucosa of the nasal passages. Desquamation of cells, of course, occurs and generally the color is somewhat paler than normal. The orbital sinuses are also often involved and one or both may contain a quantity of exudate. The nasal passages apparently re-
UNCOMPLICATED FOWL-CORYZA

turn to their normal state quite rapidly upon recovery. Birds which are killed several days after the nasal discharge has stopped generally show only a small amount of mucus in the nasal tract. A few birds, however, retain a mucopurulent exudate in the orbital sinuses for some time after the nasal discharge has disappeared. These birds may be regarded as potential carriers.

In my experience with fowl-coryza, the infection has generally remained localized in the nasal tract. There may, however, be an extension to the trachea and the outer portion of the orbital tract. Tracheal involvement is characterized by a distinctly audible respiration. The bird is gaspy and breathes with a rattling sound. Postmortem examination reveals a false membrane composed of mucus and cellular elements reflected over the tracheal mucosa. Petechial hemorrhages arranged in transverse bands are sometimes visible. Orbital involvement is generally characterized by a puffy ring encircling the eye and a marked increase in the amount of lacrimal fluid which contains leucocytes. Some birds show a foamy film between the lids and in others the lids are glued together. The orbital symptoms may disappear after a few days or may persist for a number of weeks. In the latter case, masses of exudate may collect beneath the lids and cause an outward bulging.

The incidence of birds which show these secondary manifestations appears to vary with different strains of coryza. In my experience it has been low, not over 10 per cent. I have encountered no other symptoms in experimentally infected fowl. The birds do not appear ill; they eat well and are active. Persistence of the coryza, however, does have a depressing effect on growth and egg-production, at least in birds which are confined indoors. Under laboratory conditions the specific mortality has been practically nil in so far as the New Jersey types are concerned.

The general condition of infected birds secured from flocks in which the disease is enzootic has generally been below that of experimentally infected fowl. In such cases it is difficult to know whether the condition of the bird is attributable to the coryza or to other causes. It seems probable that birds with a persistent coryza are less capable of adapting themselves to unfavorable environmental conditions than are uninfected birds. Delaplane, Stuart and Bunyea,* in a report on an outbreak of an infectious coryza in Rhode Island, noted a high death-rate particularly in young birds. At the onset of the disease, they noted,

too, a temperature rise, sometimes three degrees above normal. Later the temperature became subnormal.

**ETIOLOGY**

It is only recently that any progress has been made in establishing the etiological agent of the disease. In 1932, De Blieck, in Holland, reported the isolation of a hemophilic bacillus from the nasal exudate of infected birds. Pure cultures of the organism, which he named *Bacillus hemoglobinophilus coryzae gallinarum*, produced a coryza upon intranasal injection in susceptible fowl.

In the same year, I succeeded in isolating a similar bacillus by the cultivation of filtered exudate in fluid blood at the base of nutrient agar slants. Coarse Berkefeld candles were employed for the filtration. The permeability of several of these filters chanced to be such that they removed all other bacteria but let the specific bacillus pass through. I may say that the exudate which is present in the nasal passages may contain large numbers of secondary bacteria, at least after the first few days. These are chiefly diphtheroids, Gram-positive cocci and miscellaneous Gram-negative bacilli. The bacillus which was obtained by filtration regularly produced a coryza upon intranasal injection in normal fowl. The organism grew sparsely in fluid blood on serum but consistently failed to colonize on blood-agar plates. It was essential to have a cultural method of isolation, since differential filtration is obviously unsuited for routine work. It was finally discovered that colony formation could be promoted by sealing the plates. I have used modeling clay for making the seal but other substances, as paraffin, serve equally well. I have used this method ever since and found it uniformly successful.

The New Jersey strains of the bacillus are pleomorphic, non-motile, Gram-negative bacilli which often show polar staining. Culturally they are hemophilic, requiring the presence of blood or serum for growth. On plates they commonly show satellitism, which has been taken by some workers to mean that they require either X or V factor for growth. So far I have been unable to convince myself of this necessity. The bacillus colonizes readily on blood-agar plates which are sealed or maintained in an atmosphere of 10 per cent CO₂. It never colonizes, under the conditions which prevail in my laboratory, on open blood-plates. When first isolated the bacillus is regularly infective but tends to lose its virulence with continued cultivation. Some strains become avirulent after relatively few subcultures. Many,
however, retain their virulence for a long time. One strain which I tested at intervals was still virulent after 85 transfers. Attempts to isolate the organism from field cases by direct plating are often unsuccessful by reason of the numerous rapidly growing secondary bacteria which are present in the exudate. The preferable method is to inject a susceptible fowl with the exudate and culture as soon as a nasal discharge appears.

During the past year 1934, infective hemophilic bacilli have been isolated by Delaplane, Erwin and Stuart, in Rhode Island; by Schalm and Beach, in California, and by Elliot and Lewis,* in Maryland. These five organisms are undoubtedly closely related but their identity has not been established and until it is demonstrated I think one should be cautious in drawing conclusions. The organisms isolated by Delaplane and myself appear to show differences in virulence. It may be of some interest that his organism, which was associated with an epizootic, is more virulent than mine, which was secured from a flock in which coryza is enzootic only. Growth of these bacilli under artificial conditions is markedly affected by slight changes in the environment. Conditions which promote growth in one laboratory may not do so in another. Thus, the New Jersey bacillus in Delaplane's laboratory colonizes on open plates as do his strains; whereas, in my laboratory his strains behave like mine. Beach's culture in his hands requires CO₂ for colonization, while in mine it colonizes equally well on sealed plates. This is, I think, an indication that we are ignorant of certain underlying growth requirements.

Both Delaplane and Miss Elliott have suggested the name *Hemophilus gallinarum* for these bacilli. I have preferred to employ the non-committal term fowl-coryza bacillus until its physiology is more precisely defined. I may say in this connection that both McGaughey, in England, and I have isolated a para-influenza bacillus, a non-infective organism, from the nasal tract of normal and also infected fowl. The name *Hemophilus gallinarum* is better suited for this organism which definitely requires V factor for growth than it is for the fowl-coryza bacillus.

There can be no doubt that these bacilli are etiologically associated with fowl-coryza. In each case they fulfill the postulates of Koch. For several reasons, however, they cannot at present be regarded as the sole cause. In comparing the disease produced by the injection of exudate with that produced by the bacillus in pure culture a striking discrepancy is revealed. The

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"exudate" coryza is characterized by a prolonged course, symptoms persisting for two months or longer. With the "bacillary" coryza the course is much shorter, recovery often occurring after ten days or less. The presence of secondary bacteria in the exudate may have a modifying effect on the course of the coryza but the discrepancy cannot be explained on this basis alone. The obvious assumption is that a second infectious agent is present in the exudate. During a long contact with the disease I have never encountered any evidence that would support this assumption. I am personally inclined to the view that the fowl-coryza bacillus undergoes an immediate reduction in virulence upon artificial cultivation and is thereby more readily destroyed in the nasal passages of the fowl than is the fully virulent organism which is present in exudate. There is some evidence to support this view but not sufficient to prove it. For this reason and also because of certain discrepancies in protection tests, to which I will refer later, it is necessary to accept the etiological relationship of the fowl-coryza bacillus with reservations.

HOST SUSCEPTIBILITY

Birds from disease-free flocks appear to be uniformly susceptible to coryza regardless of age. In my experience the intranasal injection of exudate or undiluted virulent cultures of the fowl-coryza bacillus in birds varying in age from one week to two years has invariably been followed by a nasal discharge. It is evident that conditions in the nasal tract are particularly favorable for active multiplication of the specific bacillus.

Extranasal injection of the fowl-coryza bacillus is attended by quite different findings. Introduced directly into the trachea, the bacilli may in some cases multiply sufficiently to call forth a local inflammatory response. In the case of the New Jersey strains, at least, the bacilli generally do not survive for any length of time in the trachea and produce no demonstrable irritation. Brought in contact with other mucous surfaces by injection into the internal ear, under the eyelids, and into the cloaca, the bacilli do not survive long enough to elicit a local inflammatory reaction. Intratracheal, intra-aural and intra-orbital injection may, however, be followed by a migration of the bacilli to the nasal passages with a resulting coryza. It seems likely that the manifestations of orbital involvement which may accompany the disease are referable to a plugging of the nasal opening of the lacrimal duct, thus affording more favorable conditions of growth of the bacillus in the exterior portion of the orbital tract.
Injection of the bacillus in localities which are not lined by mucous membrane may in some cases be followed by a restricted growth. Subcutaneous injection is regularly attended by a local inflammatory reaction but apparently there is only a limited growth of the bacillus for cultures are often sterile. The bacilli do not migrate from the site of injection to the nasal passages. Following intraperitoneal injection, a few birds show inflammatory changes in the omentum and in some cases the bacilli can be recovered from the spleen. Of some interest is the observation that the bacillus may often be isolated from the nasal passages after intraperitoneal injection, indicating a carriage of the bacilli from the site of introduction. Generally the bacilli do not multiply to any extent in the nasal tract of these birds and do not initiate an inflammatory reaction. A single bird, of 35 which were injected intraperitoneally, showed a nasal discharge and the presence of numerous bacilli. I may say that a single bird in this series died. In this case the bacilli were isolated from the heart-blood shortly after death. Generally, however, the bacilli do not survive for any length of time in the circulating blood. In the case of the New Jersey strains no specific changes were encountered following intravenous injection. Cultures from the blood and various organs were either sterile or did not contain the specific bacillus.

COMMUNICABILITY

Fowl-coryza is readily transmitted by direct contact. Its communicability can be demonstrated experimentally by confining susceptible fowl in the same pen with injected birds. In one experiment which I conducted, five normal birds were placed in contact with five which had previously been infected by the injection of exudate, and a similar number in contact with five infected with the specific bacillus in pure culture. In each series four of the exposed birds developed a coryza, an incidence of 80 per cent. The incubation period under these conditions was somewhat prolonged, varying from four to eight days.

I have had no indication that the disease is communicable by indirect contact. Susceptible birds maintained in individual cages in the same unit with injected birds, also caged, have remained normal and retained their susceptibility for weeks. It obviously cannot be concluded that transmission by indirect exposure never occurs.

ACQUIRED RESISTANCE

I have already pointed out that establishment of the fowl-coryza bacillus in the nasal tract of the fowl is followed by an
active multiplication which the host opposes by pouring forth a semifluid exudate rich in leucocytes. In the case of the coryza produced by the injection of exudate, containing the specific bacillus, this struggle between the host and the parasite may continue for weeks. Eventually, however, a climax is reached. The nasal discharge begins to diminish and then subsides, growth of the specific bacillus ceases, and the nasal mucosa appears to regain its normal state. Unlike the normal mucosa, however, it is now incapable, at least in many cases, of supporting growth of the fowl-coryza organism. Recovery from coryza is, in short, followed by an altered susceptibility. There is some indication that this is not a general reaction, since subcutaneous injection of the bacillus in recovered birds is followed by the same restricted growth that occurs in birds of normal susceptibility. I have made relatively few observations on the duration of this resistant state but apparently it lasts for only a short period.

Recovery from the coryza produced by exudate frequently affords complete protection against immediate reinfection with either exudate or the bacillus in pure culture. In my work the recovered birds have usually been reinjected between two weeks and a month after the initial coryza had subsided. Growth of the fowl-coryza bacillus is inhibited in the nasal tract of the recovered birds. If the injected exudate contains any other specific infectious agent, it too is inhibited. This inhibition is brought about with no demonstrable inflammation. In a few cases the susceptibility of the bird is unaltered upon recovery and the introduction of exudate or pure cultures of the bacillus is followed promptly by a nasal discharge.

Birds which have recovered from the coryza produced by injection of the specific bacillus in pure culture also show an altered susceptibility to reinfection. If the bacillus, in pure culture, is subsequently injected, it is usually inhibited without an attendant inflammation. If exudate is injected, however, a different outcome is encountered. A few birds promptly develop a coryza with active multiplication of the bacillus, showing unaltered susceptibility. A few birds appear to be solidly resistant, showing no multiplication of the bacteria and no inflammation. Most of the birds, however, remain normal for some days and then suddenly, from the tenth day on, show a nasal discharge which generally does not harbor the fowl-coryza bacillus. They show, in short, a coryza of slow onset, quite different from that which is usually produced by the injected exudate. The intranasal injection of exudate from these birds in normal fowl may be
followed after one or two passages by a coryza of the usual rapid onset and the reappearance of the bacillus. In some cases, however, the continued passage of exudate from bird to bird is regularly followed by a coryza of slow onset with which the specific bacillus, at least in its usual form, is not associated.

The fact that birds which have recovered from the “bacillary” coryza are not fully protected against exudate is an additional argument in favor of a dual etiology of the disease. This observation is not incompatible, however, with the assumption that the difference between the coryzas produced by exudate and culture is referable to a degradation in virulence caused by cultivation. If the virulence of the bacilli is lowered by cultivation, it would be expected that their antigenic effect on the host would be different from that of the fully virulent bacilli and would provoke a lower state of resistance.

It is of some interest I think that a coryza of slow onset may be obtained experimentally in the above manner. There is a suggestion that the coryza of slow onset which occurs under natural conditions may be produced in the same way, namely, by the chance transmission of bacilli of high virulence to fowl which have recovered from a coryza produced by bacilli of low virulence.

The susceptibility of fowl to coryza can also be altered without actually producing the disease. As already noted, intraperitoneal injection of the specific bacillus is often followed by a carriage of the bacilli to the nasal passages and it may also be attended by an increased resistance. The bacilli which are carried to the nasal tract from the peritoneal cavity generally do not multiply there nor do bacilli which are subsequently introduced from the outside. Thus, intranasal injection of the fowl-coryza bacillus was attended by a complete inhibition of growth without the intervention of an inflammatory response in approximately 70 per cent of 25 birds which had received one or two earlier intraperitoneal injections of living cultures. The injection of exudate, as in the case of birds which have recovered from “bacillary” coryza, was generally followed by a coryza of slow onset. Other routes of injection, as subcutaneous, intratracheal and intracloacal, have had no demonstrable effect on the susceptibility of the host, at least in my experience.

**Summary**

1. Uncomplicated fowl-coryza is a specific infectious disease which may be readily transmitted to susceptible fowl by the intranasal injection of exudate from field cases.
2. Two distinct types of the disease may be encountered, a coryza of rapid onset with an incubation period of one to three days, and one of slow onset with an incubation period of nine to 27 days.

3. A Gram-negative, hemophilic bacillus is invariably present in the nasal exudate of birds injected with the coryza of rapid onset. The intranasal injection of pure cultures of this bacillus is followed regularly by a coryza, the course of which is much shorter than that produced by exudate.

4. This bacillus is not associated with the coryza of slow onset and is never found in the nasal exudate.

5. Growth of the fowl-coryza bacillus in localities outside the nasal passages is either restricted or lacking. Intraperitoneal injection may be followed by a carriage of the bacilli to the nasal tract where they generally fail to multiply.

6. The coryzas produced experimentally by the injection of exudate and cultures, respectively, are readily transmitted by direct contact but not by indirect contact.

7. Recovery from the coryza produced by the injection of exudate is followed by a solid but temporary resistance. Recovery from the coryza produced by the bacillus in pure culture is followed by a resistance which protects against reinfection with culture but only partially protects against infection with exudate. The injection of exudate in this case is often followed by a coryza of altered physical characters.

8. An altered state of susceptibility comparable to that attendant upon recovery from the coryza produced by intranasal injection of the specific bacillus can be produced experimentally by the intraperitoneal injection of living cultures of the bacillus. This resistance is provoked without an intervening inflammatory reaction.

9. A final statement on the etiology of the coryza of rapid onset must be withheld pending a satisfactory explanation of the differences in the course of the coryzas produced by exudate and by pure cultures of the bacillus and also their failure to cross-protect. The infectious agent responsible for the coryza of slow onset has not been determined with any degree of certainty.

CHAIRMAN HISEL: Thank you, Dr. Nelson.

The next paper is "The Etiology of Fowl Paralysis (Neuro-Lymphomatosis Gallinarum—Pappenheimer), Leucosis and Allied Conditions in the Fowl," by Dr. M. M. Emmel, Agricultural Experiment Station, Gainesville, Florida. (Applause.)
FOWL PARALYSIS AND LEUCOSIS

DR. EMMEL: This paper does not go into detail as to individual experiments but is a general summary, more or less, of a large number of experiments conducted on approximately 500 birds. I might say, also, that this paper was given in part before the Southern States Veterinary Medical Association, meeting in Jacksonville in October.

... Dr. Emmel read his paper. ... (Applause.)

THE ETIOLOGY OF FOWL PARALYSIS (NEURO-LYMPHOMATOSIS GALLINARUM—PAPPENHEIMER), LEUCOSIS AND ALLIED CONDITIONS IN THE FOWL

By M. W. EMMEL, Gainesville, Fla.

Agricultural Experiment Station

Fowl paralysis and leucosis have long been regarded as separate and distinct disease entities. During the last ten years, fowl paralysis has become progressively the most important disease problem confronting the poultry industry. The literature shows this disease to be of considerable consequence in practically every country of the world. Information is at hand to show that in certain countries and certain states of these United States, fowl paralysis, although considered insignificant five years ago, must now be recognized as a serious factor in their poultry industry. Although fowl paralysis and leucosis have been the subject of much investigation, particularly in recent years, no generally accepted theories have been advanced concerning their etiology.

For many years investigations into the cause of these diseases have centered around the fact that both fowl paralysis and leucosis may be transmitted to healthy birds by means of the injection of tissue filtrates and emulsions of organs from affected birds. This has led many investigators to the conclusion that the etiological agent is a filtrable virus. A few of these investigators have given some evidence to indicate that fowl paralysis may be transmitted through the egg.

Patterson, Wilcke, Murray and Henderson1 were the first to conclude that both fowl paralysis and leucosis could be induced by the injection of the same filtrable agent, consequently regarding these pathological conditions as a manifestation of a single etiological agent. Johnson2 recently confirmed this observation. Patterson, however, believed a filtrable virus the cause while Johnson termed the etiological factor a "filtrable agent."

Our investigations, extending over a period of four years, confirm the conclusion of these two investigators in that fowl
paralysis and leucosis are a manifestation of a single etiological agent but differ in the respect that we have been able repeatedly and consistently to induce these diseases by means of certain members of the paratyphoid and typhoid groups of bacteria. We have not only been able to induce fowl paralysis and the various types of leucosis with such organisms as the primary etiological agent but we have also been able to induce certain allied conditions associated with naturally occurring outbreaks of these diseases such as "going light" and sarcomatosis.

Organisms of the paratyphoid and typhoid groups of bacteria may be isolated from the intestinal tract of many birds affected with enteritis and occasionally from the intestinal tract of young birds affected with the initial symptoms of fowl paralysis.

In a series of experiments it was determined that enteritis is a necessary predisposing factor in an outbreak of the disease, in that it furnishes an avenue of infection for the primary etiological agent. It is our opinion that isolated instances may occur in which enteritis may not be a predisposing factor. Parasite-free birds fed broth cultures of the causative organisms for periods of ten and 90 days remained under observation for 150 days following the last exposure to infection and failed to develop either fowl paralysis or leucosis. Birds artificially and naturally exposed to intestinal parasites and given an opportunity for chronic enteritis to develop were similarly exposed to the causative organisms with the result that they consistently developed fowl paralysis, leucosis or an allied condition in 70 per cent of the cases. Likewise parasite-free birds exposed to the causative organisms by intravenous injection develop similar pathological conditions.

The wide variance in the pathological manifestation induced by means of this primary etiological agent is such that many investigators have been most skeptical about believing that all of these conditions could be caused by a single etiological agent. However, the pathological condition which develops depends on many factors: (1) the severity and duration of the enteritis; (2) the age and resistance of the bird; (3) the inherent properties of the primary etiological agent; and (4) the duration of the infection and the number and rate at which the causative organisms enter the blood-stream. One can readily recognize that various combinations of these factors might easily result in a wide variation in the pathological manifestation although the fundamental pathological process in each instance is quite similar. All of the pathological manifestations artificially in-
duced with the etiological agent are comparable to similar pathological manifestations occurring in natural outbreaks of these diseases in the field.

The causative organism establishing itself in the intestinal tract gains entrance to the blood-stream of the bird through an inflamed intestinal mucosa. Once in the blood-stream, the natural defenses of the bird are called into action in an effort to destroy the invading microorganisms. This action gives rise to hemocytoblastosis, the predominating cell types depending upon the rate of entrance and number of organisms entering as well as the potency of the endotoxin contained within the causative organism. Endotoxin which is an important constituent of the groups of organisms acting as the primary etiological agent now becomes an important factor in the continuation of the process. Phagocytes destroy the invading bacteria, and the endotoxin elaborated on the destruction of the bacterial cell in turn destroys the phagocyte. Endotoxin further inhibits agglutination, which results in the retarding of the phagocytic process, which may result in an increased number of phagocytes being called into action. If the organisms are too numerous to be destroyed by the phagocytes, the erythrocytes are attacked, resulting in a marked numerical decrease of these cells. In vitro 0.01 cc of endotoxin, 1 cc of which is capable of killing a 20-gram mouse in 16 hours, retards agglutination in the highest agglutination titres of a positive serum in a standard tube agglutination test. Repeated injections of endotoxin of such potency that 1 cc would kill a 20-gram mouse in five minutes have failed to induce cases of fowl paralysis and leucosis. It is of more than passing interest, however, to note that the intravenous or intraperitoneal injection of such endotoxin into young chicks often causes typical but transient symptoms of paralysis.

Only in exceptional cases during the entrance of the causative organisms into the blood-stream can the organism be isolated from the tissues of the bird.

Hemocytoblastosis once initiated, and we might say that we have never failed to initiate this process in any of our experiment birds by even extraordinary routes of infection, the process continues during the period of infection which, roughly estimated, may be as short as five days or as long as 15 to 20 days. The causative organism then seems to disappear completely from the picture.
Hemocytoblastosis, however, continues, the impetus now being due to an apparently new substance formed in the blood-stream during the initial stages of this process. This new substance is apparently a product of the disintegrating blood-cells. It is not known at this time whether endotoxin becomes a component part of this substance. That this new substance is toxic to blood-cells cannot be questioned, as the destruction of blood-cells continues with the bird attempting to compensate for this destruction by the formation of new blood-cells. The hypothesis is advanced that this new substance is of such chemical structure that the normal physiological processes of the body find it difficult to eliminate. Whether the bird eventually shows symptoms of paralysis, leucosis or an allied condition, depends upon the manner in which the process of hemocytoblastosis continues under the stimulus of this newly-formed substance. By reason that some birds recover from hemocytoblastosis of the most severe type one seems justified in believing that some birds may possess the ability to eliminate it from the body. The cell types now found in the process of hemocytoblastosis depend much upon the original impetus given by the microorganism and the "toxicity" of the newly-formed substance.

We believe that it is this toxic substance which apparently is accumulative that is responsible for the fact that fowl paralysis and leucosis are transmissible to healthy birds by means of tissue emulsions and filtrates of affected organs. In other words this substance is what has been called a filtrable virus by other investigators. The fact that when leucosis is transmitted by the use of tissue emulsions in a series of birds the incubation period becomes shorter upon each transmission in those birds which develop the disease tends to support this accumulative theory. Also by the fact that quickly induced cases of leucosis induced by the intravenous injection of the causative organisms cannot be transmitted by means of tissue emulsions. However, cases of leucosis, induced by these organisms by proper injection methods or by their natural avenue of infection, are transmissible by means of tissue emulsions and filtrates of affected organs.

The course that hemocytoblastosis now takes seems to depend much upon the resistance of the bird. While the resultant pathological condition is dependent in a large measure upon the original impetus given hemocytoblastosis, the resistance of the bird and perhaps tissue vulnerability are important factors.

The period of incubation is represented by this process of hemocytoblastosis although hemocytoblastosis continues after in-
FOWL PARALYSIS PROBLEM

Initial symptoms are shown and in the case of recovery may exist for an additional 60 or 90 days. Birds artificially infected but which later fail to show symptoms often give evidence of hemocytoblastosis over a period of 90 to 120 days. This is also true in naturally occurring outbreaks of the disease. The incubation period, shorter in young birds than in old birds, may be 20 to 250 days and in a few instances even longer.

Cases of lameness, incoordinated gait, paralysis of one or both legs, paralysis of one or both wings, partial or complete loss of equilibrium, wry neck, a spastic condition affecting the cervical muscles, blindness in one or both eyes, erythroleucosis, myeloid leucosis, “going light,” and sarcomatosis have been induced experimentally with the causative organisms as the infective agent.

Salmonella aertrycke has been found to be the most common causative organism causing natural outbreaks of fowl paralysis and leucosis. To date we have been able to induce cases of these diseases with Salmonella schottmulleri, Salmonella enteritidis, Salmonella suispestifer and Salmonella typhi-murium. There are many other organisms in the paratyphoid and typhoid groups which must be the subject of future experiments.

The importance of the discovery of the cause of fowl paralysis and leucosis in chickens is manyfold: First, it offers a working basis for the control of a group of diseases which represent the most important disease problem confronting the poultry industry; second, increased emphasis is placed on the control of intestinal parasites; third, it opens an entirely new field for the epidemiologist interested in human health, as many of the organisms concerned are capable of inducing disease in the human being; and fourth, we believe that this investigation offers a stepping-stone for the determination of the cause of leukemia in other animals as well as in the human being.

References


Chairman Hisel: I think by the time we get through with this poultry program, it is going to be necessary to institute postmortem inspection on poultry in this country.

The next paper is by Dr. Erwin Jungherr, Storrs Agricultural Experiment Station, Storrs, Connecticut, on “The Etiologic and Diagnostic Aspects of the Fowl Paralysis Problem.” (Applause.)

... Dr. Jungherr read his paper. ... (Applause.)
THE ETIOLOGIC AND DIAGNOSTIC ASPECTS OF THE FOWL PARALYSIS PROBLEM

By ERWIN JUNGHERR, Storrs, Conn.
Department of Animal Diseases
Storrs Agricultural Experiment Station

It is only four years ago that the problem of fowl paralysis was discussed before this Association, and it would seem like a repetition to present this topic again were it not for the fact that during the past few years a great deal of interest in this disease complex has become evident from both the scientific and practical standpoints. To the live stock sanitarian the disease presents a difficult problem, because it can not be classed definitely as either of infectious or non-infectious origin, in the commonly accepted meaning of the terms; the professional man who is concerned with poultry diseases is likely to become involved in a discussion of the hereditary factors of the disorder, which even at its best touches on a highly controversial subject. It is with such points in mind that we carry out the mandate of the chairman of your Committee on Transmissible Poultry Diseases, Dr. H. Bunyea, to discuss the leading thoughts which stand out in fairly pure, crystalline form from the maze of experimental evidence.

DEFINITION AND SCOPE

The term fowl paralysis, denoting as it does a clinical symptom, has given rise to misinterpretations. Diseased conditions which are accompanied by a disturbance of the locomotor apparatus and for which a definite anatomical basis can be demonstrated, such as rickets, hock disease, parasitism and A-avitaminosis, are grouped under the term “symptomatic paralysis”; other paralytic disorders, which are of rare occurrence, affect the nervous system exclusively, such as B-avitaminosis, protein poisoning, lead intoxication, botulism, and encephalomalacia, and can be classed among the degenerative nervous disorders, while fowl paralysis and epidemic tremor belong to the inflammatory nervous disorders.

In the present scientific usage, fowl paralysis denotes the disease which was first studied by Marek and for which Pappenheimer introduced the now widely accepted term neuro-lymphomatosis gallinarum. Other terms have been suggested in the course of time as, for example, polyneuritis, neuritis and neurogranulomatosis.

The occurrence of the disease has been reported from every poultry-producing country except Australia, and the losses are
variously estimated at from 10 to 25 per cent in affected flocks. The disorder attacks primarily young birds, three to ten months old, but has been observed at the age of five weeks.

The clinical picture is characterized by spastic or flaccid paralysis of the legs or wings, occasionally by disturbed equilibrium, paralysis of the crop, respiratory difficulties and blindness. In the incipient stages the birds may evince cries of pain. On pathologic examination, the internal organs appear to be normal in uncomplicated cases, while the pathognomonic changes are to be found in the peripheral and central nervous systems. If gross lesions are present, they occur in the peripheral nerves, especially in the brachial plexus, in the form of diffuse or tumor-like, grayish, soft swellings. The microscopic picture is dominated by extensive infiltrations with lymphocytes, mononuclears, plasma cells and histiocytes, accompanied by interstitial edema and myelin degeneration. Corresponding changes in the iris or vagi may account for the symptoms of blindness and dyspnea, respectively. The lesions in the central nervous system are essentially the same, except that the foci tend to occur in a perivascular situation in association with or occasionally replaced by glia nodules.

In view of recent developments the scope of the fowl paralysis problem has become considerably widened. Aside from the frequent association of visceral tumors with fowl paralysis cases, the basic studies of the disease\(^2\) did not demonstrate any relationship to fowl leucemias, but later investigators\(^4,5\) obtained evidence that the forms of Ellermann's transmissible leucosis in fowl constitute an important link in the pathogenesis of the fowl paralysis complex.

AN APPARENTLY NEW MANIFESTATION

This disorder is briefly reported here because it seems to have an important bearing upon the discussion of the etiologic aspects. During the past two years, an endemic disease of chickens in an experimental poultry plant has been under observation.\(^6,7\) It affects various breeds and both sexes, but especially males of the Frizzle variety. The disease makes its appearance at the age of six weeks, is chronic in nature, but seldom fatal. It is characterized by large irregular swellings of the leg or wing bones, which exhibit an increased surface temperature during the acute stages of the disease and are hard to the touch (fig. 1).

At autopsy the internal organs appear to be normal, and the osseous changes limited to the long bones. The distal portion of an affected bone often shows an eccentric, almost obliterated,
marrow cavity which is surrounded by hypertrophic petrified bone tissue (fig. 2); the proximal portion is greatly enlarged and porous, the periosteum is adherent, and the bone-marrow appears intensely hyperplastic.

Microscopically, the circulating blood does not reveal any striking changes except occasionally those of secondary anemia, but the cellular components of the hyperplastic bone-marrow show definite hemocytoblastic characteristics. The trabecular bone tissue exhibits peculiar honeycomb-like lines of condensation (fig. 3) which recall the mosaic architecture of bones affected with osteitis deformans, so-called Paget's disease, in man.

The disease observed by us resembles in its pathologic manifestations the sporadic osteo-periostitis described by Pugh and akropachia ossea or hypertrophic osteopathy, referred to by Reinhardt.

**Etiology**

In regard to the etiologic aspects of the disease complex, all observers agree that the disorder is not caused by a cultivable organism of bacterial or fungal nature.

Fowl paralysis has been said to be due to a non-specific reaction of the nervous system in response to intestinal injury by coccidia, tapeworms, or round worms, a claim which is based
FIG. 2 (above). Cross-section of tibia affected with osteo-
periostitis, showing eccentric marrow cavity and
hypertrophic bone-tissue (x 21).

FIG. 3 (below). High power of figure 2, showing prolifera-
tion of endosteum and irregular honeycomb-
like cement lines (x 400).

(427)
upon the statistical evidence that fowl paralysis occurs frequently in association with parasitic invasions under field conditions. This theory is difficult to reconcile with the facts that many cases of coccidiosis have been shown to be free from demonstrable lesions in the nervous system, that typical cases of fowl paralysis have been induced under controlled laboratory conditions, and that the pathologic character of the lesions in fowl paralysis does not suggest a toxic origin. The question of predisposing factors, however, must remain open, since McIntosh\textsuperscript{10} was able to induce transmissible tumors in fowls by chemical agents.

The nutritional aspects of the etiology were studied by Bayon, who attributed some curative effect to the feeding of lettuce leaves, but Wilke\textsuperscript{11} found no significant differences in the incidence of fowl paralysis when the rations varied in mineral and vitamin levels. Blount\textsuperscript{12} interpreted the disease in terms of a B-hypervitaminosis or, more generally, of a gastronomic enteritis.

Due to their practical importance, the genetic aspects have received a great deal of attention. Numerous field observations would indicate that the causative factor may be egg-borne at times, but the evidence is primarily circumstantial in nature. In an experimental study of a closely related disease, Jármol\textsuperscript{13} was unable to infect chick embryos under the age of ten days with the agent of fowl leucosis. Biely \textit{et al.}\textsuperscript{14} arrived at the conclusion that resistance to fowl paralysis is a dominant, inherited factor.

Although many investigators were unsuccessful in the artificial transmission of fowl paralysis, Pappenheimer\textsuperscript{2} was among the first to obtain positive evidence of the transmissible nature of the disease and expressed the opinion that the causative factor belongs to the group of filtrable viruses. Notwithstanding the comparatively low percentage of takes reported in this study, other workers arrived at similar conclusions, while Seagar\textsuperscript{15} and Furth\textsuperscript{16} reported on strains of neuro-lymphomatosis which were readily transmissible by parenteral inoculation, but much less so by contact.

The causative factor appears to be filtrable, can be demonstrated in cell-free tissue fluids, and thus shares important properties with the so-called filtrable viruses. It differs, however, from ordinary filtrable viruses which are the cause of well-defined infectious diseases of the type of laryngotracheitis. The transmitting agent of fowl paralysis causes a disease with a varying, often extended incubation period, it does not spread under ordinary conditions, it is strictly species-specific and does not form inclusion bodies. The number of naturally refractive
individuals is comparatively high, and the agent circulates in the blood throughout the course of illness, thereby showing a certain independence from known immunologic laws. The peculiarities of the causative factor in conjunction with its well-known property of causing tumor-like enlargements of the peripheral nerves seem to indicate its resemblance to the group of transmissible agents of other neoplasms in fowl. From a practical standpoint, the designation of the causative factor of fowl paralysis as a transmissible agent is, preferably, because it denotes clearly that it is not on a par with the filtrable viruses of laryngotracheitis and fowl-pox.

The relationship of other diseases caused by transmissible agents to fowl paralysis has received considerable study and probably constitutes the most important question in this field. It should be stated here that ordinary "big liver disease" is in the nature of a lymphoid hyperplasia which is not caused by a transmissible agent. The earlier view of Pappenheimer that visceral lymphomata may be a manifestation of the disease-complex has found experimental support in that it was possible to induce typical neuro-lymphomatosis by the injection of blood from a case of ovarian lymphocytoma. Furth, in a series of papers, reported, among others, a transmissible strain of lymphomatosis with definite neurotropic properties and a considerable morphologic range, but, on the whole, he found the type of diseases which are caused by transmissible strains to remain constant. Contrary to this conception, Patterson et al. and especially Johnson, observed that myeloid leucosis, erythroid leucosis and neuro-lymphomatosis may occur under natural and artificial conditions in response to the same filtrable agent.

In transmission experiments with bacteriologically sterile blood or bone-marrow from acute cases of osteo-periostitis it was possible to produce four typical cases of the disease among 22 inoculated chicks; eleven of the 18 remaining chicks died or were sacrificed in a debilitated condition; they exhibited two cases of anemia, two of hemocytoblastoma, one of lymphoid leucosis, and four gross lesion cases of neuro-lymphomatosis. These results tend to support Johnson's unitarian conception of the etiology of these disorders and indicate that osteo-periostitis should be included in the disease-complex.

**DIAGNOSIS**

The discussion of the diagnostic aspects is concerned here with the clinical and pathologic recognition of neuro-lymphomatosis. While an occasional increase of the lymphocytes in cases of
fowl paralysis was known to occur, Johnson\textsuperscript{5} reported a characteristic alteration of the blood-picture which consisted of an absolute increase in the leucocytes and a relative increase in the monocytes, budded lymphocytes and basophiles. Similar observations were made by Seagar\textsuperscript{10} who made these changes the basis of the so-called cyto-diagnosis of fowl paralysis. We observed\textsuperscript{7} that the blood from field cases of the disorder showed an increase of the euglobulins, as demonstrated by the mercury bichloride test and a peculiar Guttadiaphot picture, in a fairly high percentage of the cases.

In order to obtain a basis of evaluation for these tests, 84 chicks injected with diseased nerve tissues and 24 control chicks were subjected to monthly tests and were pathologically examined at the age of from three to four months.

It was found that the results of the total leucocyte count were considerably influenced by the method employed, and that a direct counting procedure was superior to an indirect one. The distribution of low, medium and high leucocyte counts among the birds which were classified as negative, suspicious and positive, was suggestive of a certain diagnostic value of the total leucocyte count. In the light of statistical analysis, however, the differences appeared to be insignificant. Similar negative results were obtained in the study of the relative leucocyte count, mercury bichloride and Guttadiaphot tests and no diagnostic value could be ascribed to them under experimental conditions.

The most interesting results in these experiments were derived from a study of the brain lesions of inoculated and control birds. In a quantitative analysis of the data it was found that the incidence of brain lesions which were regarded as indistinguishable from those of spontaneous cases was almost as high in the control lot as in the inoculated lot, and on the average amounted to 38 per cent positive and 23 per cent suspicious cases.

A qualitative study of the lesions in the brain indicated that they were of the encephalitic type, but that mononuclear and glia foci occurred together so frequently that a differentiation between neuro-lymphomatosis and epidemic tremor (Jones\textsuperscript{18}), solely on the basis of brain lesions, would be a difficult matter.

While the reported incidence of brain lesions in control birds is not thought to be representative of the general bird population, the data indicated that the brain is of secondary importance in the diagnosis of spontaneous paralysis, and that the results of intracranial transmission experiments must be accepted with reservations.
Fowl paralysis or *neuro-lymphomatosis gallinarum*, a disease of young chickens, is of widespread occurrence and is characterized by monocytic and histiocytic infiltrations in the peripheral nerves and by similar cellular reactions and glia foci in the central nervous system. It can be differentiated from symptomatic paralysis and degenerative nervous disorders on the basis of its pathologic manifestations, but brain lesions alone do not permit of a ready differentiation from epidemic tremor. The contention that the disease is caused by parasitic or nutritional injuries of the alimentary canal is not supported by experimental evidence, and the genetic aspects of the disease are incompletely understood. It is possible that factors of non-specific irritation and hereditary constitution play a contributing rôle in the natural occurrence of the disease. The causative factor of the disorder is considered to be a filter-passing, transmissible agent which is endowed with tumor-producing potentialities and is rarely transmitted under natural conditions. The term filtrable viruses for such types of disease factors should be used only with due emphasis upon the heterogeneity of the group.

The etiologic relationship of neuro-lymphomatosis to myeloid and erythroleucosis and transmissible lymphomatosis is a controversial subject in that one school upholds the constancy of the disease types, while another favors a unitarian conception. It is not clear whether this is due to impurities or to pluripotencies of the transmissible agents, or to differences in the morphologic interpretation. Evidence has been produced that hypertrophic osteo-periostitis should be included in the disease-complex.

The diagnosis of field cases of neuro-lymphomatosis can be somewhat facilitated by total and differential leucocyte counts, mercury bichloride and modified Guttadiaphot tests, all of which may give false positive and false negative reactions like other non-specific tests. The quickest and most certain method now available is the demonstration of characteristic macroscopic changes in the peripheral nervous system. Control measures should probably take into account the selection of progeny from poultry stock of known freedom from diseases and of proved livability, and the control of diseases during the growing period by sanitation. While clinically affected individuals should be removed from the flocks, wholesale slaughter or quarantine methods are not justified.

**References**

TRANSMISSIBLE DISEASES OF POULTRY


CHAIRMAN HIBEL: Thank you very much, Dr. Jungherr.

This session of the meeting will be closed with the report of the Committee on Transmissible Diseases of Poultry. We will now have that report, presented by the Chairman, Dr. Hubert Bunyea, U. S. B. A. I. Branch Pathological Laboratory, Bethesda, Maryland.

. . . Dr. Bunyea read the report. . . .

REPORT OF COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY

DR. HUBERT BUNYEa, Chairman, Washington, D. C.

Dr. Leo F. Rettger, New Haven, Dr. H. J. Stafseth, East Lansing, Conn.

Hon. Harry R. Lewis, Providence, Dr. E. L. Stubbs, Philadelphia, Pa.

Your Committee has no comprehensive report to offer, as there has been no decided change in the poultry disease situation over the country.

We feel that satisfactory progress is being made in the study of some of the more prevalent diseases, such as fowl-pox, pullorum disease, avian tuberculosis and infectious laryngotracheitis, and in the development of effective measures for their control. While it is realized that absolute eradication of such conditions is yet beyond our reach, much comfort is derived from the fact that practical control measures to some extent are available.
Concemeding some other conditions, however, the present situation is less favorable. Several complex disease problems, such as have been presented for your consideration in the preceding program, have yet to be solved from the standpoint of control. While important facts have come to light concerning the various respiratory infections of chickens, the paralysis complex, certain of the paratyphoid infections of chickens, turkeys, pigeons and water fowl, distinct from pullorum disease, etc., thus far we have only general hygienic measures to use as combative weapons against these and other more or less obscure problems. The value of these measures is not to be underestimated, however, since their intelligent and conscientious use constitutes the best form of poultry health insurance at present available.

Much has been done, but much more remains to be done, toward educating the poultry-raising public, by ceaselessly preaching the gospel of sanitation, and guiding them in its application. To this end your Committee bespeaks for the poultryman the continued and increased sympathetic cooperation of the practicing veterinarian, the experiment station worker, the extension agent, and the live stock sanitary officer in coping with his disease problems.

DR. BUNYEA: Mr. Chairman, I move the adoption of this report.

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

DR. E. A. CROSSMAN: The report of the Committee on Tuberculosis is ready at this time.

. . . Dr. Crossman read the report. . . .

REPORT OF COMMITTEE ON TUBERCULOSIS

Dr. W. J. Fretz, Saint Paul, Minn. Dr. T. E. Munce, Harrisburg, Pa.
Dr. C. C. Hise, Oklahoma City, Dr. C. E. Cotton, Saint Paul, Minn.
Okla.

On several occasions during the last 17 years, your Committee has proposed recommendations to amend the Individual Accredited Herd Plan and the Modified Accredited Area Plan, always having in mind the interests of the live stock industry and the promotion of tuberculosis eradication.

We now feel that the time has arrived when another slight change should be made in the Modified Accredited Area Plan. We therefore recommend that under paragraph 25, entitled "Movement of Cattle into Modified Accredited Areas or Areas Under Quarantine," Section B be changed as follows: After the word "Steers," in first line, strike out "range cattle or semi-range cattle of recognized beef type" and insert the words "and spayed heifers" so as to read: "Steers and spayed heifers not originating in Modified Accredited Areas, except those originating in herds known to be infected with or exposed to tuberculosis, may enter the modified or quarantined area for feeding or grazing purposes without being subjected to a tuberculin test prior to entry, provided permission for such movement is granted by the proper state live stock sanitary official of the state of destination, such cattle to be held separate from other cattle in the modified or quarantined area. Steers and spayed heifers for feeding or grazing purposes, originating in herds known to be infected with or exposed to tuberculosis, shall be required to pass a negative tuberculin test before movement under the provisions of this paragraph, provided permission for such movement is granted by the proper state live stock sanitary official of the state of destination, and shall be accompanied by a tuberculin
test chart and health certificate issued by a duly authorized agent of
the state of origin."

We further recommend that the Tuberculosis Eradication Plan be
carried on intensively and that the retesting in modified accredited
areas be followed according to the plan before they are due to become
re-accredited.

DR. RECORDS: I move that the report be referred to the Executive
Committee.

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

CHAIRMAN HISEI.: The President has requested that Dr. Cary read
the report of the Committee on Tick Eradication at this time.

. . . Dr. Cary read the report. . .

REPORT OF COMMITTEE ON TICK ERADICATION

DR. C. A. CARY, Chairman, Auburn, Ala.

Dr. L. J. Allen, Oklahoma City, Dr. H. L. Darby, Fort Worth, Tex.
Okla.

Dr. T. W. Cole, Jacksonville, Fla.

Texas: The report of the U. S. inspector-in-charge gives the following
record: 19 counties are now actively engaged in tick eradication; 15
counties in the southeastern part of the state are inactive; 31 counties
released from quarantine have herds in them that remain under local
quarantine. The balance of the 254 counties in the state are released
and in white.

Florida: The U. S. inspector-in-charge reports the following condi-
tion in Florida:
1. The remainder of the quarantined parts of Glades, Highlands
and Lee counties were released on December 1, 1934.
2. Active counties that are now working are Hasco, Charlotte and
Henry.
3. The following counties have been dipping since April 1, 1934:
Hillsboro, Polk, Naroff, Maraton, Sarasota and DeSoto.
4. One noted change in Florida is the finding of *Boophilus annulatus
Australis*. This tick infests more hosts than the common fever tick,
and it also carries the Piroplasma of tick fever. It will be more dif-
ficult to eradicate than the old fever tick.

Louisiana: According to the report of the U. S. inspector, 17 parishes
were cleaned of ticks in 1934. Also a number of other parishes were
worked. This leaves 23 inactive uncleaned parishes in the state of
Louisiana.

Mississippi: According to public reports, seven to nine counties in
south and southeast Mississippi became reinfested with fever ticks
some time during 1934, and were placed in quarantine by the State
Veterinarian. It is supposed that the reinfestation was brought in
from Louisiana in some way.

DR. CARY: This report is not signed by the Committee but by a
number of men in tick states. I move its adoption.

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

DR. CARY: I want to add one thing, not from the Committee. Last
year, the Committee reported that no cattle from inactive ranges could
be shipped interstate anywhere. A few of the states adopted that;
the government did not. But it had a good effect, especially on the
state of Louisiana, if they did the work they say they did.
I want to say to you, I hope the states and the government continue the recommendation of last year's Committee and do not let any cattle come out of inactive areas. What is the advantage of it? It will stimulate those areas to work, and it did last year, and it will do it next year.

I did not put that in this report because I could not get it before the Committee. That is not as an official report of the Committee but as a report of mine, if you want to take it that way.

CHAIRMAN HISSEL: Gentlemen, this meeting will reconvene promptly at 1 p. m.

... The meeting recessed at 12 noon. ...

RECESS

FRIDAY AFTERNOON, DECEMBER 7, 1934

The sixth and final session convened at 1:50 p. m., President Robinson presiding.

PRESIDENT ROBINSON: Gentlemen, you will kindly come to order. The next on the program is the report of the Committee on Parasitic Diseases, Dr. Ward Giltner, Chairman.

DR. C. H. CLARK: As Dr. Giltner had to leave, he asked that I present this report.

... Dr. Clark read the report. ...

REPORT OF COMMITTEE ON PARASITIC DISEASES

DR. WARD GILTNER, Chairman, East Lansing, Mich.

Dr. C. F. Schlotthauer, Rochester, Dr. W. H. Hendricks, Salt Lake
Minn. City, Utah.
Dr. J. E. Shillinger, Washington, Dr. B. A. Beach. Madison, Wis.
D. C.

PREVALENCE AND DISTRIBUTION OF THE PARASITIC FAUNA OF DOMESTICATED ANIMALS IN THE UNITED STATES

The Committee on Parasitic Diseases of Live Stock desired to obtain information as to the exact methods employed by parasitologists and pathologists for determining the prevalence and distribution of parasites of domesticated animals in the various states of the Union. A circular letter asking for information on this point was sent to investigators in the field of parasitology at each of the experiment stations in the Union.

To date, 39 replies to this circular letter have been received. These replies indicate that our principal source of information as to the prevalence and distribution of parasites of domesticated animals is dependent on the postmortem examination of diseased animals. That this source of information does not present accurate data is indicated by the following facts:

1. A review of the annual reports of animal pathologists reveals that the presence of parasites was recorded only when these were considered to be the primary cause of the trouble, and in many instances the tabulation is simply "parasitism" without giving any information as to the species and approximate numbers of the parasite or parasites found.

2. Since, as is recognized by parasitologists, parasitism is made possible because the parasites are adapted to a fairly normal physiological condition of the organs invaded, and not to a pathological
condition of these organs, if a pathological condition is brought about, even by the parasites themselves, they are unable to maintain a parasitic existence and are eliminated. Thus, often it may happen that postmortem examinations fail to reveal parasites even in cases when parasites were contributory to, if not the primary cause of, death.

3. Because of the immense amount of material which a pathologist must examine in making postmortems, obviously it would be impossible for him to collect and identify more than a few of the numerous different species of parasites which may be present.

In verification of these statements we found that of the 39 states reporting, 32 use postmortems and accessions, and seven have no system at all for obtaining data on parasitisms.

Typical of the data presented are those found in the 1932 report of the Veterinary Division of Michigan State College.

Pathology Department (Sholl and Coburn)

Material from postmortems and accessions

Animals examined ............................................ 754
Parasitism reported ........................................... 105
Groups of parasites indicated. .............................. 98
Cases in which parasites are involved. ..................... 203
Other causes .................................................. 542
The ratio ........................................................ 1:3.7

Grouping of the 98 cases of parasitism

Uninarianias .................................................. 11 Verminous pneumonia : 8
Trichiniarias .................................................. 1 Tapeworms ................. 7
Whippom ......................................................... 2 Blackhead ................. 1
Ascariasis ....................................................... 20 Schistosoma ............. 1
Teniasis ........................................................... 8 Intestinal worms ......... 1
Coccidiosis ..................................................... 35 Feather mites ........ 1

Bacteriology Department (Stafseth and Thompson)

(2,760 birds examined)

Coccidiosis .................................................... 251 Tapeworms ............... 353
Chronic parasitism ......................................... 108 Gizzard worms .......... 5
Round worms ................................................... 85 Gape worms ............... 1
Round worms and tapeworms 120 Scaly legmites ......... 1

Thus of 2,760 birds examined, there were 924 cases of parasitism, a ratio of 1:3.

In obtaining any worthwhile data as to the prevalence and distribution of the parasites of domesticated animals in any state, it would appear that the most rational procedure would be to conduct a systematic and intensive survey of the parasitic fauna present in the average run of the flock or herd rather than to depend on postmortem examinations of diseased animals.

It is obvious that various districts in each state should be surveyed. It is also obvious that because of the large number of different species of parasites which may be present in many different species of domesticated animals, the number of animals examined must be limited, but the number examined should be sufficiently large to give a fair index as to the species and numbers of parasites present in any given area.

The important of parasitism as a factor in the health of domesticated animals has not, in the past, been given enough consideration. This may be due largely to observations on the part of many that apparently healthy animals may sometimes harbor an appreciable number of one or more species of parasites. Suggesting a possible explanation for these observations, it may be well to point out that parasitism is a balanced relationship between the parasite and the
host, resulting from the fact that each has become adapted to this type of relationship. A parasite lives at the expense of the host; but, especially in the case of various intestinal parasites, as long as the host is able to maintain its side of the balance no appreciable damage as the result of the presence of the parasite is apparent.

If, however, due to faulty nutrition, to the administration of injurious drugs, to bacterial infection, or other causes, the vitality of the animal is impaired, the parasites may either increase in numbers or the host may not be able to neutralize toxic materials given off by the parasites in their struggle for existence, resulting in many instances in extreme damage to the host, due to the parasites themselves, as well as in making it more difficult for the host to overcome any bacterial diseases which may have been the cause of upsetting the balance. The pathological effect of parasites of vital organs, such as the brain and circulatory organs, cannot, of course, be denied; but in view of the principles of parasitism the control of intestinal parasites such as protozoa, the various types of round worms and tape-worms, and the various types of skin parasites, would seem to be very important.

An intelligent formulation of measures for the control of parasites of live stock must be based on a fairly accurate knowledge as to the prevalence and distribution of the parasites, and the possibilities of the spread of various species of parasites from one area to another and from one species of animal to another. This is especially true as regards parasites of definitely proved pathogenicity, and the vectors of the same.

Any program leading to the control of any given species of parasite must include prevention as a primary measure and, in these days of rapid transit in the matter of interstate and interdistrict shipment of live stock, prevention can best be accomplished if we have an adequate knowledge as to the prevalence and distribution of the parasite in every section of the country. Parasites hitherto foreign to certain localities have been detected in these localities and apparently are rapidly becoming established. For example, in Michigan during the past year, there has been identified the brown dog tick *Rhipicephalus sanguineus* in several kennels. Other parasites which previously have not been found north of the Ohio border are occasionally encountered in native animals. Whether it will be possible to accomplish anything worthwhile in the control of parasites of live stock through quarantine measures remains a problem. In the case of certain species of parasites much has been accomplished by control measures in certain districts. It is obvious, however, that before any measures (whether by quarantine, medication, or sanitation) leading to the control of parasites of live stock can even be thought of, a more accurate knowledge as to the prevalence and distribution of the various species of parasites of domesticated animals and the various factors influencing their transmission must be had. This probably can best be accomplished through systematic survey, as above suggested, rather than through postmortem examinations of diseased animals.

As we understand it, the function of this Committee is to obtain, or devise methods for obtaining, a more adequate knowledge as to the prevalence and distribution of parasites of live stock. In the light of the above statement this Committee at this time goes on record as advocating that a systematic survey of the parasites of live stock be undertaken, and also suggests that the United States Live Stock Sanitary Association find ways and means for bringing it about.

**Horse Parasite Control**

Dr. B. J. Killham, Extension Specialist in Animal Pathology at Michigan State College, kindly made a survey of the horse parasite control
### Table I—Survey of the horse parasite control work in the United States.

<table>
<thead>
<tr>
<th>State</th>
<th>Concerted Effort to Control Horse Parasites</th>
<th>How Many Past Year?</th>
<th>Will Work Expand or Decline?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arizona</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arkansas</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>California</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Colorado</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Connecticut</td>
<td>No</td>
<td>Some</td>
<td>Expand</td>
</tr>
<tr>
<td>Delaware</td>
<td>No</td>
<td>-</td>
<td>Expect to expand</td>
</tr>
<tr>
<td>Florida</td>
<td>No</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>Georgia</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Idaho</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Illinois</td>
<td>Yes</td>
<td>50,000</td>
<td>Depends on farm income</td>
</tr>
<tr>
<td>Indiana</td>
<td>No</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>Iowa</td>
<td>Yes</td>
<td>Several thousand</td>
<td>Expand</td>
</tr>
<tr>
<td>Kansas</td>
<td>2 counties</td>
<td>1,500</td>
<td>Expand</td>
</tr>
<tr>
<td>Kentucky</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Yes</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>Maine</td>
<td>2 counties</td>
<td>50</td>
<td>Expand</td>
</tr>
<tr>
<td>Maryland</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Michigan</td>
<td>Yes</td>
<td>20,000</td>
<td>Expand</td>
</tr>
<tr>
<td>Minnesota</td>
<td>No</td>
<td>4,000</td>
<td>Neither</td>
</tr>
<tr>
<td>Mississippi</td>
<td>Yes</td>
<td>10,771</td>
<td>Expand</td>
</tr>
<tr>
<td>Missouri</td>
<td>No</td>
<td>No data</td>
<td>Depends on farmers' ability to pay</td>
</tr>
<tr>
<td>Montana</td>
<td>Just starting (No state project)</td>
<td>1,000</td>
<td>Expand</td>
</tr>
<tr>
<td>Nebraska</td>
<td>No</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>Nevada</td>
<td>No</td>
<td>-</td>
<td>Left to local veterinarians</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>New Jersey</td>
<td>No</td>
<td>Some</td>
<td>Should expand</td>
</tr>
<tr>
<td>New Mexico</td>
<td>No</td>
<td>-</td>
<td>Extreme interest</td>
</tr>
<tr>
<td>New York</td>
<td>No</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>North Carolina</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>North Dakota</td>
<td>No</td>
<td>10,000</td>
<td>Expand</td>
</tr>
<tr>
<td>Ohio</td>
<td>No</td>
<td>Some</td>
<td>-</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>No</td>
<td>-</td>
<td>Expand</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>Yes</td>
<td>20,000</td>
<td>Expand</td>
</tr>
<tr>
<td>Oregon</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>South Carolina</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>South Dakota</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tennessee</td>
<td>No</td>
<td>100</td>
<td>Decline unless public is educated</td>
</tr>
<tr>
<td>Texas</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Utah</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vermont</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Virginia</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Washington</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>West Virginia</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Yes</td>
<td>20,000</td>
<td>Expand greatly</td>
</tr>
<tr>
<td>Wyoming</td>
<td>No</td>
<td>400</td>
<td>Expand</td>
</tr>
<tr>
<td>Ontario</td>
<td>Yes</td>
<td>6,000</td>
<td>Expand</td>
</tr>
</tbody>
</table>

(438)
work in the United States. In order to collect data regarding horse parasite control work in the various states, he sent out the following questionnaire:

1. Has there been a concerted effort to control horse parasites in your state?
2. If so, approximately how many horses were treated during the past year?
3. In your opinion, will this work expand or decline?

A tabulated summary of his findings is incorporated in this report. (See table I.) In brief, he found the following states active: Illinois, Iowa, Kansas, Michigan, Minnesota, Mississippi, Montana, Nebraska, North Dakota and Wisconsin. The province of Ontario also reported active work under way.

**Parasites in Wildlife**

The Bureau of Biological Survey of the U. S. Department of Agriculture, in its study of diseases of wildlife, has made a special effort to learn what relationship many forms of parasites have on the native wild species of this country. Through the process of examining great numbers of grouse, rabbits, deer and foxes, as well as other important game and fur species, a fair knowledge of the most injurious parasites has been gained. The destructiveness of the various parasites affecting wildlife is not measured alone on the basis of the specific injury done by the larger parasites themselves but also on the extent to which they may injure a large group of hosts through the spread of small virulent pathogenic organisms.

Weighty evidence points to the action of external parasites as playing an important part in the periodic disappearance of important species over extensive districts in this country through the spread of *Pasteurella tularensis* and probably other pathogenic organisms. Epizootics of tularemia almost wiping out the cottontail rabbits and spreading the disease also to game birds have been traced to the presence of great hordes of infected ticks parasitizing dense populations of these species. In studies made in selected typical game areas in the north central states, it is not unusual to find an average of several hundred ticks on individual grouse during a large portion of the year and as many thousand ticks on the hares and rabbits. When one considers the probability of the transmission of a disease in a dense animal population where ticks of the two-host species abound in numbers of from 1,000 to 5,000 per rabbit, it is not surprising if insect disease vectors may be shown to be the necessary biotic factor in the cyclic disappearance of game at these periodic intervals. Evidence of this has been established in the findings, by Green and Shillinger, of many tularemia-infected ticks free on the bushes and other vegetation awaiting attachment to final hosts.

In Montana, during the past year, a glaring example of disease transmission from wildlife to domestic forms by two-host ticks was made evident by the attachment of many wood ticks to sheep in a flock of sheep recently placed on a range where jackrabbits and ground squirrels were dying in great numbers. Investigation showed that these wild forms were dying with tularemia and over 200 sheep out of a band of 1,200 were lost with this disease.

The Bureau of Biological Survey has recently cooperated with the U. S. Public Health Service in rat control measures in the South in order to reduce the chances of rat fleas from affected Norway rats transmitting Brill's disease to human beings. Likewise, in order to protect the local human populations from attacks by fleas from ground squirrels, many of which are affected with bubonic plague, the Bureau

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*Prepared by Dr. J. E. Shillinger.
of Biological Survey has cooperated with the U. S. Public Health Service and state authorities in the West in conducting extensive rodent-control operations. While heroic efforts are being made to control these diseases by destroying the primary hosts of the parasites transmitting them, it appears to be virtually impossible to completely eradicate them or their parasites.

Widespread losses in young wild ducks from parasitism has been described in detail by O'Roke, of the University of Michigan. In this disease he has shown that the protozoan organism, Leucocytozoon anatis, living in the blood-stream and causing an extensive destruction of erythrocytes, is transmitted by the small black biting fly, Simulium venustum. In the face of unprecedented drouths for successive years destroying the breeding sites for waterfowl, this combination of parasites is of especial importance.

Losses of many wild ducks in the East have been shown by Dr. Willard Greene to be due to a protozoan blood parasite of the malarial type attacking the erythrocytes.

The wolves in the Great Lakes district of North America have recently been found by Fitch to be harboring the tapeworm, Taenia echinococcus, the larval form of which he observed encysted in the lungs of moose. The insidious danger of this parasite in animals and man calls for no elaboration.

Other forms of big game such as elk, deer and mountain sheep have been found to be parasitized to an excessively harmful degree in various parts of the country. The cephanomyia fly larvae attacking these species in the nasal and frontal sinuses are frequently found in such locations as to cause violent nervous symptoms and in some instances cause suffocation. Mr. H. D. Ruhl, of the Michigan State Conservation Department, reports as many as 100 of these large larvae in a single deer.

Lungworms under certain conditions have been found to be exceedingly numerous in members of the deer family in many locations throughout the country. While under favorable environment some of the animals appear to tolerate large numbers of these worms in the lung tissues, it is evident that under unfavorable conditions they form the origin of fatal pneumonia. The excessive infestation of some of our large game animals with ticks, as described by Fitch, in Minnesota, may alone be ascribed as the probable cause of the severe anemia observed in moose.

Boynton and Woods, in California, have shown the mule deer to be a carrier of anaplasmosis and Anderson, in Texas, has observed actual infections of this disease in the whitetail deer in the state.

A Bureau of Biological Survey employee, working at the University of Minnesota, has recently demonstrated the transmissibility by ticks of large cornified tumors taking the form of horns on wild rabbits.

On fur farms and game farms, through the proper use of anthelmintics and the exercise of adequate hygienic procedures, parasitism is well controlled with the exception of lungworms. The most prevalent species, Capillaria aerophila, is the most difficult to cope with on account of the tenacity of the eggs. Many fur-farmers have been forced to provide expensive wire-floored pens in order adequately to prevent gross infestation with these worms.

A CONTROL PROGRAM FOR LIVER-FLUKE DISEASE IN UTAH*

For the past several years, numerous losses have been sustained in both cattle and sheep due to liver-fluke infestations. These losses have

*Prepared by Dr. W. H. Hendricks.
PARASITIC DISEASES

come to our attention by way of reports directly from stock-owners in various sections of the state. As a result of these reports, investigations have been made from this office which disclosed the fact that in a great many sections of the state of Utah liver flukes were exceedingly prevalent. More actual losses occurred in sheep than in cattle, but we frequently found that cattle were unthrifty and that when cattle from these particular infested areas were marketed the post-mortem reports showed quite a heavy liver-fluke infestation.

We have realized for some time that this situation was gradually getting more serious and that it would be advisable, as soon as arrangements could be made, to institute some control program. In a great number of cases individual owners of sheep have resorted to the use of "flukoid" capsules with some degree of success, but this did not get at the root of the evil as it only served partially to control infestations in animals that were already harboring the adult flukes.

We were fortunate in having the assistance of the Zoological Division of the U. S. Department of Agriculture. A parasitologist, under the direction of Dr. M. C. Hall, had been assigned to liver-fluke control work in some of the western states and we had the opportunity of cooperating in this work. Dr. L. E. Swanson has been working in Utah in this connection and with his help we have been able to make a survey which has given us the information regarding sections of the state where the snail, which is the intermediate host of the offending liver fluke, is more commonly found. We have also had the cooperation of the federal meat-inspection service, and the inspectors-in-charge have furnished us with postmortem reports, giving rather complete information regarding both cattle and sheep infested with liver flukes. By this method we have been able to trace numerous infested cases back to the areas where they grazed.

We endeavored to carry out a program of snail eradication by use of the copper sulfate treatment of streams, sloughs, marshes, etc. We were able, in some cases, to induce county commissioners to purchase copper sulfate and furnish some labor and then let it be properly distributed under our supervision. This procedure resulted in eradication of the snails in some districts.

In one particular section we have an Indian reservation and it so happens that the streams, sloughs, etc., on the reservation, as well as portions of the county directly adjoining it, are heavily infested with liver-fluke-carrying snails. In this particular case we were fortunate in getting the cooperation of the Indian Agency to purchase copper sulfate and use it, in cooperation with our department, so that the snails could be eliminated on their ground and also on the areas contiguous to it.

A project that may develop to greater proportions and one that, in our estimation, has more merit than anything we have been able to do is one under which we are now operating. In this particular instance we submitted the proposition to the local FERA officials, whereby we could use relief labor as one of the make-work projects. It took considerable effort, but we finally were able to get such a project in Beaver County, which was heavily infested. The FERA people agreed to buy the copper sulfate and other necessary materials to be used and furnish the necessary labor to work under the direction of Dr. L. E. Swanson.

I might state here that one of our chief obstacles in getting this project approved was objection advanced by the State Fish and Game Department. It was their contention that copper sulfate placed in the fishing waters would destroy the trout and other forms of aquatic life. It was necessary, therefore, in order to get the project approved, to cooperate with the Fish and Game Department and to agree to stay out of trout waters.
UNIFICATION OF LAWS AND REGULATIONS

After arrangements were finally completed, the project was started on September 18, 1934, with an FERA appropriation of $8,808.14. Of this amount, $1,144.54 was to be used for materials. Three tons of copper sulfate crystals was purchased for $300.00, and six and one-half tons of copper sulfate (powdered) for $715.00. It was also necessary to purchase buckets, hand scales, burlap bags, shovels, forks, axes, rakes and scoops. The personnel used on the project included 60 laborers per day, for a total of 14,400 hours for the project; three truck-drivers and trucks to convey men and materials to work for a total of 720 hours; one stenographer and four foremen, one for each gang of 15 men.

All creeks and streams were cleaned of rubbish and vegetation before treatment, and this cleaning and draining, it is estimated, eliminated approximately 50 per cent of the snails. The crystal copper sulfate was used in streams at a rate of 12 pounds per second foot flow, mixed by a weir. The powdered copper sulfate was broadcast on the sloughs and creek banks in a proportion of one pound of copper sulfate to four pounds of dirt.

This particular project is just being completed and the area treated was approximately six miles wide by ten miles long. Dr. Swanson advises that from his personal observation 98 per cent of all snails are destroyed. The treatment began at all headwaters and continued across the valley.

We feel that if we can follow up this work in each infested area and cooperate with the stock-owners, we can get a long way toward the control of liver flukes in Utah. We are now making arrangements to carry on this work in other counties. We find that there is a very great spirit of cooperation manifested by stock-owners.

The project is not free from pitfalls, but we feel that with careful supervision most of them can be overcome.

REPORT OF COMMITTEE ON UNIFICATION OF LAWS AND REGULATIONS

Dr. W. H. Welch, Chairman. Lexington, Ill.
Dr. H. M. O'Rear, Washington, D. C. Dr. D. M. Campbell, Chicago, Ill.

Your Committee desires to cite the very comprehensive report of last year which emphasized the additional difficulty involved in unifying the laws and regulations governing the interstate shipments of live stock, because of the decision of the United States Supreme Court in the Wisconsin-New York case, which, in the absence of federal
regulations governing interstate shipments, upheld the right of each individual state to deny entrance to any foreign animals that might menace their own live stock population. It was cited that greater uniformity was highly desirable, and in many instances obtainable, and the recommendation was made that this Association continue efforts to induce the Congress of the United States to enact legislation granting each state authority to promulgate regulations for the importation of live stock into its own commonwealth, such regulations to be effective only after approval by the Secretary of the United States Department of Agriculture.

With the present methods of transportation, the truck must now be considered as a common carrier, and without doubt represents, today, one of the greatest factors in the dissemination of transmissible diseases. These trucks ply their trade, not only from one farm premise to another, but in many instances carry live stock interstate in open violation of state or federal regulations. In many instances this is done innocently, the operator of the truck being in absolute ignorance of such regulations. Railroads are made aware of such regulations, and are held responsible for any violations of the same. We believe that this same information should be extended to every truck-owner at the time of his purchase of a license to operate said truck, and that violations of the same should be more vigorously prosecuted. We would therefore recommend that the sanitary authorities of the various states cause to be printed information relative to the responsibilities, liabilities and penalties by the truck-owner in the illegal transportation of live stock and that this warning be placed in the hands of every purchaser of a truck license, preferably at the time of said purchase.

Community sales have reached a point in numbers and size in the dispersal of live stock where they may be said to constitute the greatest unregulated menace to the health of our domestic live stock. The extension of regulatory control to such cesspools of animal disease distribution as have not already received such attention is a present challenge to all live stock sanitary officials and must be met.

DR. WELCH: I move its adoption, for reference to the Executive Committee.

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

PRESIDENT ROBINSON: The next report is that of the Committee on Legislation, by Dr. D. E. Westmorland, of Frankfort, Kentucky.

DR. WESTMORLAND: Mr. Chairman, the Committee has no report.

PRESIDENT ROBINSON: The next is the report of the Committee on Policy, by Dr. J. R. Mohler, of Washington, D. C.

DR. MILLER: Dr. Mohler has no report.

PRESIDENT ROBINSON: The next is the report of the Committee on Resolutions. I will ask Dr. J. L. Axby to read it.

DR. AXBY: This is a resolution on vivisection, referred to the Executive Committee, acted upon favorably by them, then referred to the Committee on Resolutions, and they report it favorably for your action.

DR. AXBY read the resolution. (See page 279.)

PRESIDENT ROBINSON: Gentlemen, you have heard the resolution. What is your pleasure?

DR. BUNTEA: I move its adoption.

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

Dr. Miller read the report of the Committee on Tuberculosis (page 433) which had been referred to the Executive Committee.
DR. MILLER: As I understand it, the Executive Committee is recommending that this plan not become effective until July 1, 1935.

DR. HISEL: Mr. Chairman, I move the adoption of that report.

DR. GOW: I second the motion.

DR. PORT: I would like to offer an amendment to the recommendation of the Committee. I would like to recommend that it not be adopted for a year, January 1, 1936, that it be extended until that time.

The reason I am asking for this, gentlemen, is I do not feel that this regulation is applicable to our condition at this time. A year ago, you remember, the stockmen of the western states came to this meeting and made suggestions as to regulations they wished to have adopted by the organization for the eradication of tuberculosis in range cattle. They sincerely appreciated the courtesy and the privileges that were extended to them through this organization by granting them, very largely, what they had in mind in the testing of certain percentages of their cattle.

They went back home and immediately started to place their herds in such position that they could test these cattle and comply with the regulations as speedily as possible. Through the Jones-Connally Bill they have been granted quite a large sum of money to continue with this work, and they are doing it just as fast as they can get the herds in shape.

Now the organization, in the absence of these men, comes forth with a regulation asking these men to tuberculin test the heifers that are going into modified accredited areas and originating from areas which are not accredited, and giving the steers a clean bill of health to go into these areas. You have no conception of the hardship that this regulation is going to place upon a lot of these stockmen who are back there working conscientiously to get their areas modified as speedily as possible.

Just to cite an example, with many of these herds which come from the mountains and are trailed 60 or 70 miles to a railroad for shipment, the owner starts out with the idea that he is sending his stuff to market, to an open market. After he gets it to the point of shipment, he finds a buyer there who will offer him a better price for these cattle than the market affords. They will be shipped into an area for feeding. This regulation imposes on that man the necessity of testing all the females in the shipment and holding the cattle at that point for 72 hours to give them the tuberculin test. These points are not equipped in such a manner that you can administer the test effectively. They do not have chutes to run the cattle through and hold them for 72 hours, in addition.

I think we are just a little too hasty in coming forth with this regulation at this time. If you will give these men a year to operate with the Jones-Connally money and give them a chance to get the herds cleaned up as fast as possible, then after this money is no longer available, I would say next year, if such a regulation were enacted, it would be more plausible, it would be an encouragement for these men to support an appropriation for that work. They would be more inclined to get behind the movement and appropriate the money for the eradication of tuberculosis, to finish up the areas and those which are not completed.

Therefore, gentlemen, I wish that this regulation could be laid over for one year.

DR. GOW: I also come from a state where we produce feeders, the state of Colorado. A year ago I came before you with some of my cattlemen. We asked for some concessions from this Association; you
gave them to us. We went back after we got the concessions and I told them what was going to happen.

At that time Dr. Mohler asked, "When will you start testing?"

I said, "We have no money."

He smiled and said, "If you had the money, when would you start testing?"

I said, "Right away."

Well, in June the money was made available. I put it up to our western slope men. In our state, it takes 51 per cent of the cattle-owners or 51 per cent of the cattle to be signed before they can declare a county in an accredited state. I have been in 33 of our western slope counties. I did not tell them they had to test their cattle.

I said, "Sooner or later you have either got to come under the modified accredited area plan or you will have to test your cattle at the time you ship them. You produce feeders. It is for you to make your own choice."

I have yet to have a cattleman who owned any cattle refuse to sign the petition. In Colorado we argued with them, we admit that; we stalled it off. But you might just as well, at one time or another, set a definite date as to how you are going to handle these cattle. We will not finish the work by July, 1935. I know that, but we would tell them when it is going to be finished. It is up to them. If they want to have it done, they will come in and cooperate. I hope the Association votes for this.

DR. HISEL: Mr. Chairman, may I read this from the Constitution: "The Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies. All recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee."

Mr. Chairman, I move to amend my original motion, as that motion was out of order.

DR. MUNCE: I second the motion.

PRESIDENT ROBINSON: I was under that same impression. This resolution was ironed out by the Executive Committee and approved. Therefore, I put the amended motion as made by Dr. Hisel. All those in favor of his motion will signify by saying "aye"; those opposed "no." The motion prevails.

We will now listen to the report of the Committee on Revision of Constitution and By-Laws, by Dr. T. E. Munce.

DR. MUNCE: Mr. Chairman, the appointment of this Committee was the result of a question which was brought up on the floor of the house last year. As Chairman of the Committee on Revision of Constitution and By-laws, I inquired of the Secretary as to what brought about the appointment of the Committee. He informed me that one member last year raised the point that the Association, by adopting certain reports and recommendations, was not carrying out the provisions of the Constitution and By-laws.

As a result of, I might say, a hurried and probably not well thought out suggestion, it was moved that a Special Committee on Revision of Constitution and By-laws be appointed.

I went to the member who had raised the question and asked him the particular thing he had in mind. His statement was to this effect: that he had no objection whatever to the present Constitution and By-laws, but he did think, with which, of course, I agreed, that the Association should follow the Constitution and By-laws.
After consulting with the other members of the Committee, and the officers, it was not deemed necessary at this time to make any recommendation to change.

In substance, Mr. President, that is the report.

PRESIDENT ROBINSON: Dr. Munce, do you have a special report on Bang's disease?

DR. MUNCE: I haven't a report. It was considered at the meeting of the Executive Committee. My understanding is, especially in view of the action just taken, that that does not come before the house, although I shall be very glad to read the action of the Executive Committee.

PRESIDENT ROBINSON: I think it would be well to read it.

DR. MUNCE: In prefacing this report, the night before last, at a meeting of the Executive Committee, it was decided, in the form of a resolution, that a special committee be appointed to make recommendations with reference to the control of Bang's disease.

The committee appointed by the Chairman of the Executive Committee, Dr. Hisel, was Dr. Cary of Alabama, Dr. Duckworth of California, Dr. Cotton of Minnesota, Dr. Axby of Indiana, and the speaker.

We had a meeting last night, canvassed the situation, as we felt, fully, and made the following report, which I am about to read, to the Executive Committee.

REPORT OF THE SPECIAL COMMITTEE ON BANG'S DISEASE

The Committee recommends:

1. The states should adopt a definite plan for the control of Bang's disease.

2. All reactors to the test approved by the state live stock sanitary authority shall be reported, properly identified and quarantined. (The report down to this point was unanimously agreed upon by all five members of the Committee. On No. 3, which I am about to read, approval was withheld by one member of the Committee, Dr. Duckworth, of California. The other four members agreed to it.)

3. No cattle shall be imported into any state until they have passed a satisfactory negative agglutination test for Bang's disease, except cattle for immediate slaughter, spayed females and feeder bulls and steers.

This was signed and approved by four members of the Committee. The report as presented was approved by the Executive Committee today.

PRESIDENT ROBINSON: I don't think this requires any action at this time.

Here are some more reports that were approved by the Executive Committee. You heard them read previously. I don't think they require any action at this time. One is the report of the Committee on Transmissible Diseases of Swine; the report of the Committee on Miscellaneous Transmissible Diseases; report of the Committee on Transmissible Diseases of Poultry, and report of the Committee on Tick Eradication. They have all been approved by the Executive Committee.

Are there any further reports, or is there any further business at this time?

DR. C. E. COTTON: Mr. President, I am informed that the Committee on Resolutions had no report. There was a resolution prepared to be
given to the Committee but, as I understand it, the Chairman was not present, and the Committee did not meet.

I wish to take this opportunity to present a motion that this Association send a letter of appreciation to Senator Robert LaFolleté, of Wisconsin, for his efforts and his work in succeeding in obtaining, through Congress, the appropriation whereby some of these monies that are being spent by the federal government in the reduction of surplus cattle could be expended in a way that would result in a permanent benefit to the cattle industry.

I, therefore, move that some expression, letter or communication, from this body, be sent to Senator LaFollette to that effect.

Dr. Crossman: I second the motion.

... The motion was put to a vote and carried. ...

President Robinson: Is there any further business?

Dr. Gow: I would like to ask a question on parliamentary rule in connection with the report of the Committee on Bang's disease. Has it been approved by anybody?

Dr. Miller: I think the question Dr. Gow is raising is whether that resolution has any force and effect unless this body passes on it. As I understand, it never had been before this body for any action.

President Robinson: Do you mean you want this body to take action on it?

Dr. Gow: I would rather have it lie idle for a year.

President Robinson: If we don't take action, it will lie idle.

Dr. Gow: Thank you. I wanted to be clear on that point.

Election of Officers

President Robinson: Now, gentlemen, we come to election of officers. According to usual custom, I was instructed to appoint a Nominating Committee. I did so and announced it. I am going to call on the Chairman of that Committee for his report.

Dr. Axby: Mr. President, your Committee finds that it is no small and meager duty to endeavor to pick out a personnel of officers for this Association. It, however, by way of endeavoring to comply with that duty, has given very careful thought, taking into consideration the various angles of the duties to be performed, as well as the geography of the country, hoping that its conclusions will redound to the very best interests of the Association as a whole.

Mr. President, your Committee on Nominations begs leave to make the following report:

President: Dr. Edward Records, Reno, Nevada.

Vice Presidents:

Dr. Walter Wisnicky, Madison, Wisconsin.

Dr. R. W. Smith, Concord, New Hampshire.

Dr. D. E. Westmorland, Frankfort, Kentucky.

That is signed unanimously by J. L. Axby, H. C. Givens and H. D. Port.

I move the adoption of the report.

Dr. Munce: I second the motion.

President Robinson: You have heard the motion and the second. What is your pleasure?

Dr. Munce: In order to make this legal, I would suggest that the motion embody that we suspend the By-laws and that the Secretary
be instructed to cast a ballot for the nominees as proposed by the Nominating Committee.

DR. PORT: I second the motion.

PRESIDENT ROBINSON: You have heard the motion and the amendment as made by Dr. Munce. All those in favor of this report signify by saying “aye”; those opposed “no.” The gentlemen are elected for the ensuing year.

I would ask that Dr. Port and Dr. Seidell escort the incoming President to the platform.

... President-Elect Records was escorted to the platform by Doctors Port and Seidell. ... (Applause)

PRESIDENT ROBINSON: Members of the United States Live Stock Sanitary Association, I am pleased to present your new President. (Applause)

PRESIDENT-ELECT RECORDS: I hardly think any speeches are needed or warranted. I have been attending these meetings rather regularly now for about twenty years. Up until this year, I think the experiences have been almost uniformly pleasant and profitable. Apparently I have monkeyed around and come once too often and have gotten myself into rather a bad jam.

If I am given the support, encouragement and help that all my predecessors have had, I think I shall probably be able to carry on after a fashion. I only hope you will join me in wishing for the best. (Applause.)

PRESIDENT ROBINSON: Now we will call on the Vice-Presidents. Dr. Wisnicky, First Vice-President.

FIRST VICE-PRESIDENT WISNICKY: I appreciate this expression of confidence that you have placed in me, and I will try to assist in my humble but earnest way in working in behalf of this Association and assisting your President.

I thank you. (Applause.)

PRESIDENT ROBINSON: Dr. R. W. Smith, Second Vice-President. (Absent.)

Dr. D. E. Westmorland, Third Vice-President. Will you kindly come to the platform?

THIRD VICE-PRESIDENT WESTMORLAND: I wish to thank the Association for the honor conferred upon me. I am sure I will endeavor at all times to do my duty as far as I am capable.

I thank you. (Applause.)

PRESIDENT ROBINSON: Now, gentlemen, before turning over the gavel to your new President, I again want to thank the members of all committees, in fact, every member of the Association, for the assistance they have given me during the past year.

Dr. Records, I realize that the Association is in good hands. I congratulate you and I hope that you will derive as much pleasure out of the office during the coming year as I have in the past. (Applause.)

... President-Elect Records assumed the chair. ...

... Dr. Hisel extended an invitation to the members to attend the meeting of the A. V. M. A. in Oklahoma City next August. ...

DR. MUNCE: Mr. President, I would like to make what I am going to say in the form of a suggestion rather than in the form of any formal motion.

With regard to the various recommendations that have to do with changing the tuberculosis accredited herd plan, the modified plan and also, perhaps, Bang's disease and other diseases for which this Asso-
NEW BUSINESS

The Association has seen fit to prescribe definite rules and regulations concerning control, and as the time is so short, after arrival here, for the presentation of those changes and consideration of them, it has been suggested, with which suggestion I am heartily in accord, that any member who may have changes to suggest in any of those plans of procedure send them to the Secretary in advance. I am not prepared to say whether it should be 30 or 60 days, but they should send them in advance to the Secretary who will, in turn, be instructed to mail them to the various state and federal regulatory officers in charge of the work, so that we will have time to review and consider them prior to coming here.

I am not going to make that in the form of a motion but simply as a suggestion. It would probably pave the way for a little bit better understanding than perhaps prevails at the present time.

President Records: Dr. Munce, you are an old-time member of the Constitution and By-laws Committee. Possibly you can answer a question that also came up today. Is there any reason, based on the Constitution or By-laws, why these various committee reports are placed practically at the end of the meeting, or is that just a matter within the discretion of the Secretary and the officers who get up the program? Do the By-laws provide that the reports be placed as they are now?

Dr. Munce: It is entirely in the hands of the Program Committee. I rather think, after discussing the matter with the Secretary-Treasurer, that in previous years the committee reports have been placed at the end, but there is nothing to prohibit having them, say, on the second day of the meeting. I have the feeling that perhaps next year that will be done. That will give opportunity for the Executive Committee to receive the reports prior to the final adjournment of the meeting.

President Records: That seemed to be the sentiment. If that were done, it would help the situation quite a great deal.

Following Dr. Munce's suggestion of individuals sending suggestions to the committees well in advance, then placing the committee reports rather early in the program, that would probably iron out a great many of these little misunderstandings, confusions and delays that have occurred.

Dr. Curry: Mr. President, Dr. Munce in his suggestion mentioned individual members. I would like to add to Dr. Munce's suggestion that the reports of the various committees, Tuberculosis, Bang's Disease, Hog Cholera, Diseases of Poultry, et cetera, be placed in the hands of the Secretary, and that any information pertaining to the amendment or change of regulations governing the movement of various live stock, that may be evolved, be placed in the hands of the respective live stock officials or the so-called Executive Committee of this Association in order that they may have, in advance, knowledge of proposed changes and amendments and discuss matters of that sort with their constituents back home before they come to this Association, and thereby be in position to vote intelligently on proposed changes.

President Records: As there seems to be no constitutional bar, Dr. Curry, I think that would be perfectly permissible as a motion.

Dr. Curry: I make that as a motion.

Dr. Munce: I second the motion.

President Records: It is moved and seconded that, in addition to the suggestions already made, the various committees be definitely charged to prepare their reports at least 60 days in advance of the date of the meeting and transmit them to the Secretary who, in turn, shall transmit them to the ranking regulatory official of each state at least 30 days in advance of the meeting.
DR. C. E. COTTON: Mr. President, how in the world will you set up the necessary machinery to function? Will you have the committees gather from all over the country to prepare reports to be submitted 60 days prior to the meeting, and pay their expenses to do that? I can't see how it is possible.

DR. CROSSMAN: As Chairman of the Committee on Tuberculosis, our original report, after corresponding with several members of the Committee, was simply to come before this organization and say that everything was just fine and dandy, that everybody was perfectly satisfied, and we had no recommendations to make this year.

After arriving in Chicago some parties appeared before the Committee, making certain requests. We certainly had to listen to them. Just how in the world you are going to do this 30 or 60 days before this organization holds its annual meeting, I cannot see. Unless you want to go to the great expense of bringing the committees here in advance, it simply means that all the essential work of the committees, of this whole organization, will be postponed twelve months. In other words, on reports of committees that are able to report today you would not take action until a year from now.

DR. CURRY: Mr. Chairman, I don't know but what that would be a desirable thing. It would give all the qualified members of the Executive Committee, who are charged with the responsibility of enforcing rules and regulations as recommended by this organization, an opportunity to weigh them carefully and then to take action. Rather than to incur additional expense by having the committees convene in advance so as to pass that information on to the respective members, let them make their recommendations to this Association, to be voted on at the next meeting which, of course, would be twelve months following.

Not many of us know much about the changes and recommendations that are made until we come in here and go into executive session and then in one hour's time attempt to pass all recommendations of committees that are presented for consideration.

DR. WISNICKY: I think this is a problem to which we should give consideration, because I found myself in identically the same position that Dr. Curry speaks of. Nevertheless, I feel we have to be practical as well as entirely right.

From the practical standpoint, I do not see how it would be possible to get all these changes to the Secretary, and, in turn, distributed to the various livestock sanitary officials so far before the meeting. Many points develop during the meeting, and there is a divergence of viewpoints which makes it necessary to get a report that may be of a compromise nature. It absolutely requires the meeting of a committee before the final report can be given out, because it is at that meeting where the report is put into final form.

I believe, however, it would be advisable to follow the policy suggested to the extent possible that, if anyone has any proposed change in the rules or regulations pertaining to interstate shipment of livestock, or some other rule or regulation, that information be sent to the Secretary so that he might disseminate it, but I doubt whether it would be right to make this a mandatory thing.

DR. COTTON: Mr. President, I can recall very well that this Association some years ago adopted a definite ruling relative to the Committee on Tuberculosis, particularly. The Chairman of the Committee was instructed to notify all regulatory officials that there would be no action taken on any proposition relative to amendments unless it was submitted to the Chairman of the Committee at least 60 days prior to the meeting. What was the result? There were no suggestions until we arrived here, and then there were all kinds of them.
NEW BUSINESS

I think Dr. Curry's argument is a sound one. As a suggestion, in lieu of his proposition, it might be well to adopt a plan, providing that no action will be taken on anything that makes a material change until such time as it has been presented either to the Secretary of the Association or the Chairman of the Committee 60 days prior to the meeting, and he, in turn, would send the material to all the regulatory officials stating that that had been submitted. Then they would be in position to come here with the information from their constituents as to how they should commit themselves on the vote. It seems to me that would perhaps be the most practical solution. At one time it did not work. They did not send anything in. The committees came here with nothing before them, and the material was presented to them during the session.

DR. HISEL: Mr. President, in the meeting of the Executive Committee during the noon hour there was a motion made and passed that the Chair appoint a committee to make some specific recommendations to the Bureau of Animal Industry for the control of pullorum disease. For fear that committee is not endowed with the power necessary to function, I desire to move that this organization go on record as favoring or sponsoring or standing back of the recommendations of that committee, composed of Dr. Fitch of Minnesota, Chairman, Dr. Curry of Missouri, and Dr. Axby of Indiana.

PRESIDENT RECORDS: Can you hold that in abeyance for a minute? There is a motion before the house.

DR. CURRY: In reply to my good friend, Dr. Cotton, he has the same thought but has expressed it in a different way than what I have attempted to convey to the Association. Dr. Wisnicky referred to the statements here. We are not directly involved in this thing at the present time but next year we may be. Who knows? There are many men, live stock officials, who come to this Association meeting and are confronted with a problem they knew nothing about at the time they left home. Some of them are going to have a lot of explaining to do to their constituents when they get back home. My thought in this was to avoid having things of that sort occur, that they be given advance information as to the proposed changes that committees are going to recommend, that may vitally affect conditions in their states.

We go into the committee room with one hour and pass all these things without giving due deliberation to them. This is all I have in mind. I am not affected this year, but next year I may be. Who knows?

PRESIDENT RECORDS: Is there any further discussion? It is rather an important proposition, if anybody else wants to speak. If not, we will vote on Dr. Curry's motion. Those in favor signify by saying "aye"; those opposed "no." I guess the "noes" have it. The "noes" have it.

DR. HISEL: I don't feel that it is necessary to make that motion over again. I think the committee ought to have that power.

DR. MILLER: I second the motion.

PRESIDENT RECORDS: Is there any discussion on Dr. Hisel's motion? If not, those in favor please signify by saying "aye"; opposed "no." The motion is carried.

Is there anything else to come up?

DR. ROBINSON: I move we adjourn.

. . . The motion was seconded, put to a vote and carried. The meeting adjourned at 3:10 p.m. . . .

ADJOURNMENT
FINANCIAL STATEMENT

O. E. DYSON, Secretary-Treasurer

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CURRENT ASSETS—U. S. Treasury Certificates $2,300.00
U. S. Bond ($100.00 bond gift to Secretary) $3,400.00
Cash Balance in Bank $545.49
$6,245.49

LIABILITIES—None.

STATE MEMBERSHIPS

Alabama Iowa Nevada Pennsylvania
Arizona Kansas New Hampshire Rhode Island
California Kentucky New Jersey South Carolina
Colorado Maryland New Mexico Texas
Connecticut Massachusetts New York Utah
Delaware Minnesota North Carolina Vermont
Florida Mississippi North Dakota Virginia
Illinois Missouri Ohio Wisconsin
Indiana Montana Oklahoma Wyoming

Los Angeles County, Calif.
U. S. Bureau of Animal Industry
Canada Department of Agriculture

December 1, 1934.
39th Annual Meeting
United States Live Stock Sanitary Association
Hotel La Salle, Chicago
December 4-5-6
1935