

*Continued production of livestock in Iowa on an intensive scale was dependent upon healthy animals. Iowa scientists and farmers worked together to stop disease threats and to prevent further ones.*

## 15. Combating Animal Diseases— and Winning

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NO ASPECT OF FARMING HAS BEEN MORE DRAMATIC OR more important to the farmers' economic well-being during the past hundred years than the battle against animal diseases. In no phase of the farmer's life has the change from traditional rule of thumb methods to scientific procedure been more marked than in this field. In few other periods in history has animal disease been as important to the farmer, as it has to the Iowa farmer in this one-hundred-year period which saw the development of intensive livestock production. In some instances disease caused farmers to shift from one kind of livestock to another.

Findings have been far-reaching. Most of the early work on hog cholera leading to the development of a satisfactory method of immunization was carried on in Iowa.

Sometimes the impetus for scientific research has come from sudden severe outbreaks of disease which wiped out livestock. At other times, sickness of humans, passed on to them by animals, has been the influence that caused action. This factor was largely responsible for the campaigns resulting in greatly reducing tuberculosis and Bang's disease.

A poor German farmer in Crawford County had purchased from an unscrupulous seller an old horse suffering from a "bad cold." In a few weeks the other team owned by this man became similarly affected, one of them dying within a short time. The owner held a post mortem examination, hoping to make some discovery that would guide him in successful treatment of the two remaining animals. Five days later he was attacked with glanders and on the fifteenth day he died. Another death occurred in Clarke County, near Osceola. A farmer's wife,

who had assisted her husband in the treatment of several sick horses, contracted an eruptive disease and died within a short time. Her death was attributed to glanders by her physician and a visit to the farm by the state veterinarian proved that these horses were suffering from glanders.

Influenced by the serious situation among the horses of the state and the public health hazard verified by the deaths of these people, "rules and regulations for the prevention and restriction of contagious diseases among domestic animals" were proclaimed by the State Board of Health on December 28, 1884. These rules were very stringent and have remained in effect. They covered recognized diseases which were far fewer than at present. As new diseases were recognized, amendments were made until all diseases known to exist in the United States are covered.

The first official act by the Iowa Legislature for the control or suppression of animal diseases was passed in April, 1884. Up to that time a great deal had been said about control of animal diseases, but little had been done, and nothing in a state-wide program.

The act provided for the appointment, by the governor, of a state veterinarian to serve three years, and be a member of the State Board of Health.

Section 2 of the act prescribes the duties of the office as follows:

The state veterinary surgeon shall have general supervision of all contagious and infectious diseases among domestic animals within or that may be in transit through the state, and he is empowered to establish quarantine against animals thus diseased, . . . make rules and regulations . . . for the prevention, against the spread, and for the suppression of disease. . .

The method of inaugurating action in the case of outbreaks of disease was as follows:

Whenever . . . any (county) board of supervisors, city council, . . . or township trustees, shall in writing notify the governor of . . . any of said diseases, he shall notify the state veterinary surgeon who shall at once repair to the place designated in said notice and take such action as the exigencies may demand.

This program of disease control has continued to include almost universal vaccination of swine against cholera; horses against encephalomyelitis; cattle against blackleg and anthrax; the eradication of tuberculosis in cattle and swine; the control of Bang's disease in cattle by testing and calfhood vaccination, and the extinction of glanders and dourine in horses by testing and slaughter of infected animals.

Governor Buren R. Sherman appointed Dr. M. Stalker in 1884 to the newly-created position of state veterinarian. Dr. Stalker was at that time head of the Veterinary Department of the Iowa State Agricultural College at Ames. He continued to hold both positions for about fifteen years.

The state veterinarian today directs a staff of twelve veterinary inspectors, in charge of field work in ten districts. Employed by the Division of Animal Industry of the State Department of Agriculture, they are assisted by seventeen federal inspectors who work for the United States Bureau of Animal Industry. The principal duties of the combined forces are in connection with the suppression, control, and eradication of tuberculosis and Bang's disease, equine encephalomyelitis, hog cholera, rabies, sheep scabies, and pullorum disease in poultry.

Combating diseases such as tuberculosis, anthrax, foot-and-mouth disease, glanders, Texas fever, and hog cholera is based on well-defined and recognized methods. Chief of them are quarantine; slaughter of infected animals; immunization by vaccination or serum treatment; destruction of intermediate hosts and sanitation. Sanitation includes disinfection, pasture rotation, and proper disposal of body wastes and dead animals. For some diseases one of these methods may be sufficient. For others, combinations of two or more may be necessary.

Quarantine, at least at certain stages of disease, is applicable in all diseases. It alone is not sufficient to bring about eradication of any disease. Applied to individual premises, or even to such large areas as states, it tends to confine the disease to the area already affected, thereby protecting other areas. In the outbreaks of foot-and-mouth disease, Texas fever, and pleuropneumonia in this country, quarantine has played an important part.

In the campaigns to eradicate tuberculosis, foot-and-mouth disease, and to a lesser degree Brucellosis, the slaughter method has found great favor with sanitary officials. This is largely due to the fact that these diseases are apt to become chronic. Infected animals live a long time or even recover, thereby maintaining the infection in a herd and endangering oncoming generations of animals. The choice of this method of disease control depends largely on the incidence of the disease in a country. In the United States the slaughter method is the one preferred for foot-and-mouth disease. It is, without doubt, more practicable economically than others. In Europe this is not the case, because the disease is well established, widely distributed and of high incidence. Continental European countries resort to quarantine and

sanitation. Vaccination is also practiced with doubtful effect, since the only vaccine yet developed is far from perfect.

In the United States the slaughter method is not followed for the control of hog cholera, since the disease is generally distributed and protection can be obtained by vaccination. In Canada, where the disease is not so well established, the slaughter method is preferred. Wherever the slaughter method has been successfully applied, it is accomplished only by the state or the federal government or both paying indemnity to the owners for all animals destroyed.

With some diseases eradication of the intermediate host, which harbors the real cause of disease without being adversely affected, is more easily accomplished than the destruction of the real cause. This was especially true of Texas fever, in which periodic dipping of cattle resulted in elimination of the tick without which the causative parasite cannot exist.

#### GLANDERS

In his first annual report for the year ending June 3, 1885, the state veterinarian reported glanders as alarmingly present in many parts of the state—with 350 cases found during the year in forty-eight counties. Indicating the need for stringent disease control laws which were to be enacted, he called attention to a racket of that time wherein “unprincipled jockeys and professional traders procured infected animals that were not yet debilitated, patched them up and sent them off to other localities where they were sold at a great bargain to the uninitiated.” He ventured the opinion that in three-fourths of all the cases of glanders he encountered during the year, a trade was an important part of the history. This fact, with the additional one that the horse was the most widely traveled of all domestic animals, explained why the disease had become so widespread.

The specific cause of glanders was in dispute among health authorities, many holding to the theory of spontaneous origin in long protracted cases of debilitating diseases without exposure to a case. Dr. Stalker held to the opinion that contagion was the chief, if not the only, cause of glanders in this country. In the formulation of rules and regulations for the control and eradication of glanders, public opinion was on the side of Dr. Stalker, influenced by the death of several individuals.

No record of the use of mallein as a diagnostic agent for detecting glanders was made until the issuance of the state veterinarian's report in 1893. This test remains today the only means of detecting glanders

and has led to the elimination of the disease. In the 1894 report it was indicated that quite general use of the test had been made that year and a note of encouragement was added to the effect that, "whereas ten years ago fifty-one counties were infected, with the destruction of 350 cases, during the past year barely a dozen animals were destroyed and with ordinary precautions there need not be a general infection." This prediction proved accurate. For the past several years no cases have been observed and it can safely be said that complete eradication of the disease has been accomplished in Iowa. The United States Bureau of Animal Industry's report states that occurrence of glanders is negligible in the United States.

#### ANTHRAX

Anthrax also was of importance, as indicated in Dr. Stalker's first report: "Most cattlemen have had more or less experience with the disease." This first report came only five years after Pasteur's experiment with a vaccine in France. Dr. Stalker mentions this work but makes no mention of the vaccine having been applied in Iowa. Rather, he enumerates various medicinal agents then common but unsuccessful. Among them were hyposulphite of soda, chlorate of potash, nitromuriatic acid, and quinine. None of these, he states, "would probably stand the test of careful experiment." Apparently the only control measures attempted by the state department were isolation of infected animals, with change of pastures to clean high ground and proper disposal of carcasses of animals dead of the disease by deep burial, or preferably by burning, with the caution never to skin or open the carcasses and to exercise care in handling the same to prevent human infection by such contacts. In subsequent reports of the state veterinarian few outbreaks of anthrax were reported until 1910 when there were many, some of them extremely severe. By this time, however, vaccination was practiced and rigid quarantines were established so that control was soon attained.

#### TEXAS FEVER

During the eighties, Texas or tick fever was the most serious disease of cattle threatening stock raising in the South, and its cause was not known. It had been introduced in Mexico during colonization of that country by the Spanish. The first reported outbreak in the United States occurred about 1800 and, strangely enough, was found in a herd in Pennsylvania which had been shipped into that state from South Carolina. All outbreaks in the North were observed to

occur in the summer and to disappear after the first heavy frosts in the fall. It was further observed that the southern cattle, which were the supposed source of the disease, in most cases showed no evidence of disease. In some cases direct contact of native cattle with them had not occurred but the native cattle sickened after they had occupied the same pastures. This was later satisfactorily explained when the relationship of the cattle tick in the dissemination of the causative agent became known.

In 1890 it was definitely proved that the tick is the carrier of the minute blood parasite that is the real cause of the disease. Without the tick as the intermediate host of this parasite the disease is of but slight importance. It was rightly concluded that the best way to fight the disease was to eradicate the tick. This proved possible in either or both of two ways: by excluding all host animals from infested pastures, whereby the ticks perish, or by systematic dipping of all animals maintained on the infested pastures, whereby the ticks are destroyed before they become engorged and drop to the ground.

The spread of the disease from the South was greatly favored by the practice of driving cattle overland to better pastures in the Midwest and Southwest. The threat to the cattle industry was so great that several states enacted laws prohibiting the importation of cattle from infected areas. In spite of this, the disease rapidly advanced and the problem of control became a national one. In 1889 a federal quarantine line was established which forbade the movement of southern cattle into northern areas except for immediate slaughter under special quarantine restrictions. This resulted in checking the further spread of the disease but not in improving conditions in the quarantine area. Some southern cattle raisers advanced the theory that ticks were in some way responsible for the disease and the Bureau of Animal Industry sent experts into the South who verified this theory.

Thorough application of the cattle-dipping practice has eradicated the tick in all except two small areas of the original fifteen infested states in the South. These pioneer investigations of the cattle ticks pointed the way for further studies that resulted in the control of such human diseases as yellow fever, Rocky Mountain spotted fever, typhus, and malaria, which are spread by ticks, fleas, and mosquitoes.

The only serious outbreak of Texas fever ever officially reported in Iowa occurred in 1884 at LeMars. It originated from several carloads of cattle shipped to that point from Mississippi. They were unloaded and placed on range for a few days. Then a part were shipped and the rest driven to Dakota. About eighty head of cows

owned in LeMars were taken daily to a pasture used by these Mississippi cattle for four days before being driven to Dakota. Fifty-two days later the town cows became ill with Texas fever and all but one or two died. Fortunately with winter soon coming on all ticks which transmit the disease were killed and there was no recurrence.

### RABIES

Rabies was another disease of occasional occurrence at this time, perhaps the most dreaded of the diseases of lower animals transmissible to man. Fantastic stories of the behavior of rabid animals, particularly the dog, were current as well as equally fantastic remedies—such as madstones—for the treatment of the disease in the human. Regarding one of these Dr. Stalker had this to say:

I have received a fair share of criticism for warning the public against the popular superstition on the subject of madstones. No one would be more gratified than myself to know there was in existence a means so efficacious as the virtues imputed to the madstone. But I would fall far short of my duty to the public if I were not to caution them against the employment of means in favor of which there is not a scrap of trustworthy evidence, to the exclusion of those measures that might be of infinite service. Men who have devoted a long lifetime to the study of this subject know nothing of the virtues of madstones. They are unknown therapeutical agents to the world of educated medical men. In a word, this is but one of a long list of imaginary remedies that have found favor from the earliest historic time in the minds of the credulous.

So intense was the fear of the people at this time that schools in some localities were almost deserted because teachers and pupils were afraid to venture out and risk attack by mad dogs. This was a period sometime before Pasteur had developed a vaccine against the disease and the only known method of control was by slaughter or muzzling. Later reports of the state veterinarian indicate that rabies became more serious. In 1910 there was a great deal, but by this time vaccination was common and most outbreaks were short lived. In recent times only sporadic outbreaks have been reported.

### PLEUROPNEUMONIA

There was great concern in Iowa at this time lest contagious pleuropneumonia of cattle might be introduced through importation of cattle from areas in the United States where it was prevalent. This disease, previously unknown in America, had only recently been introduced in this country through cattle imported from Europe. The cattle of the neighboring states of Illinois and Missouri were suffering severely and the danger of its spread to Iowa was imminent. To prevent such a calamity a proclamation was issued by Governor Sherman in

June, 1885, calling attention to the danger. A quarantine was proclaimed against the states of Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Ohio, Kentucky, Tennessee, Indiana, Illinois, Missouri, and the District of Columbia. In 1886, ten thousand cattle in Illinois were affected. Prompt action by the Bureau of Animal Industry resulted in suppression of the disease. With the exception of the exposure of one herd near New Sharon, Iowa herds escaped.

Not the least important effect of this outbreak of pleuropneumonia was that it brought to the attention of thinking people the necessity of national action if such a scourge were to be suppressed. Community or even state action was not sufficient. The disease had been recognized in Europe for a hundred years before it appeared in this country. It was introduced here by importation of breeding cattle from Europe in 1854, but was limited to the extreme eastern part of the United States for a long time. It appeared first in the vicinity of Dayton, Ohio. From there it was carried to western Illinois by breeding cattle purchased in Ohio in 1884. It was soon widely distributed in that and nearby states. The chief of the Bureau of Animal Industry sent his inspectors west to investigate. Quarantine and slaughter, measures long used in Europe for its control, were adopted. Opposition of cattle raisers to such radical measures was encountered but authorities were not deterred. After the policy of paying indemnity for all animals destroyed was adopted, the program was successfully carried through. By 1892 no evidence of the disease could be found in any of the states where it had existed except in New Jersey. This state had refused to co-operate with the Bureau in enforcement of its regulations, but through action of the Congress the Bureau was empowered to enforce its own regulations. In 1893 the Bureau reported: "One year after the last case of the disease expired on the 25th of March, 1893, the entire force engaged in this inspection was dismissed at the end of that month." It has never since recurred, due to stringent importation regulations.

#### DOURINE

In 1886 a stallion imported from France was put into service at Bloomington, Illinois. This led to an outbreak of dourine, a disease devastating in its effect and rapidly spread through coition. Some of the animals infected were moved from that district, thus establishing new centers of infection in South Dakota, Nebraska, and Iowa. Rigid control measures were enacted and the disease was soon under partial



control. Occasional cases were detected. In 1906 a serious outbreak occurred in southwestern Iowa, which was not brought under complete control until 1916. Through the combined efforts of the Iowa Department of Public Health and the Bureau of Animal Industry, all stallions and jacks in the five infected counties of southwestern Iowa were tested, and all reacting animals were destroyed under condemnation, with compensation paid owners. Thus was another threat to the livestock industry averted by prompt co-operative action of animal health authorities.

#### SHORTCOMINGS IN THE LAWS

Until about 1900, the law of 1884 seemed adequate to control animal diseases. As time went on, however, new diseases appeared and brought new problems with them. Although the state had become efficient in suppressing disease within the state, diseased animals imported from other states caused serious loss before the disease could be suppressed.

Gradually it became apparent to those responsible for control of infectious diseases in Iowa that little could be accomplished under the laws and regulations then in effect, and under the greater handicap of inadequate appropriations by the legislature to assure enforcement of the meager laws. At every session of the legislature, attention was directed to the situation and the need for increased appropriations was stressed. In 1910 serious outbreaks of anthrax in western Iowa were traced to stock shipped in from other states. Nearly all cases of glanders occurring there were likewise traceable to horses brought into the state. These two incidents, connected with others involving importation of breeding cattle with tuberculosis, prompted the enactment of more stringent laws.

Regulations then in effect specifically forbade any part of the money appropriated by the legislature for the use of the state veterinarian in enforcement of regulations, being used to reimburse the owner of any stock destroyed under provisions of the law. This practically nullified his power to enforce the law which stated that he could order such destruction. As a consequence, livestock owners opposed the killing of their diseased stock and action looking to eradication of tuberculosis lagged. A few forward-looking cattle breeders requested application of the tuberculin test to their herds, agreeing to stand the losses for condemned animals. Naturally there was little or no progress made in a state-wide effort to control disease.

## TUBERCULOSIS

Development of tuberculosis in Iowa cattle is recorded in the early annual reports of the state veterinarian. Dr. Stalker's first report in 1885 stated:

There are many cases of this disease, especially among high bred cattle and those that have been subject to high forcing processes. The custom of the time of fitting breeding cattle for sale by close confinement, blanketing, and forced feeding to capacity, followed by their sale to owners who furnish them no more protection against snow and sleet than is offered by the side of a corn crib or a barbed wire fence, results in their catching cold which terminates in consumption.

He also observed that there was a strong tendency for the disease to descend from parent to offspring. Causative organisms of the disease had been first seen by investigators in Europe only a year or two previously and little or nothing was known about its transmission from animal to animal.

No further mention of tuberculosis in the earlier annual reports was made until 1888 when, in the summary of 1,463 animals examined for various conditions, it was stated that but one case of tuberculosis was found. This may indicate that the disease was then rare in Iowa cattle, but many cases may have existed unrecognized. The next year, 1889, the only mention made concerning tuberculosis was that, "In the aggregate it carried off a considerable number of cattle, but never assumed the form of an epizootic."

That there really were many more cases than were being recognized is suggested in the annual report made in 1894 when it was stated that the most serious problem the state veterinarian's office had to deal with was tuberculosis. The tuberculin test by that time had come into use and upon its application to suspected herds, many more cases were being found than previously had been detected by physical examination. Dr. Stalker stated that in a herd of fifty-one milk cows he had, by applying tuberculin, found twenty-seven reactors and a half dozen other suspects. This herd was furnishing the milk supply of an Iowa town. He further directs attention to the public health hazard through the consumption of both meat and milk products derived from infected animals. Inspection of slaughtered animals in packing houses was then very superficial. It was the practice of owners of diseased animals to place them on the beef market as soon as it became apparent that they were reaching the stage of decline from disease.

Seventeen head of registered Angus bulls imported from Minnesota were sold at auction near Waukon. The herd was placed in quarantine the day of the sale and tuberculin test was applied. Eleven of the

seventeen animals reacted. The state herd of dairy cattle at Independence had been increased by the addition of forty-four cattle purchased in New York. In 1909 the herd was tested and fifty-one of eighty-nine head on hand reacted. Twenty-three of them were from the group purchased in New York. At a previous test before the New York cattle had been added, no reactors had been found. Herds at other state institutions were then tested, since importations of out-of-state cattle and exchanges between institutions were being made. More than one-fourth of the 360 cattle at four institutions were found to be reactors. This was a startling reminder to legislators that drastic measures would need be taken if the livestock industry of the state were to be protected.

The campaign to eradicate bovine tuberculosis in the United States was inaugurated in May, 1917. This was to be a co-operative federal-state program for the establishment of accredited herds and was offered for voluntary acceptance by the cattle owners. To encourage its adoption, indemnity was to be paid for all reacting cattle sent to slaughter, based on the appraised value agreed upon by the owner and the representative of the government. One-half this sum was paid by the federal government and half by the state. This met with widespread approval by many cattlemen but with considerable opposition from others. Later, when area testing became obligatory, violent resistance was encountered in a few areas. The most notable of these occurred in Cedar County where groups of farmers, encouraged by agitators against the plan, gathered at farms where government veterinarians appeared to apply the test and forcibly prevented these agents from performing their duties. To enforce the law it became necessary for the governor to call out the National Guard. In time such opposition was gradually overcome and the plan was universally accepted. About twenty years later the last two unaccredited counties of the United States were officially declared to be modified accredited areas, and the entire United States now holds that status, which means that bovine tuberculosis has been reduced to less than one-half per cent. It required more than two hundred twenty-five million tuberculin tests and retests and the slaughter of nearly four million tuberculous animals to accomplish this. In some badly-infected areas as many as 80 per cent of the cattle were infected. The cost of the campaign was enormous, but the dividends are correspondingly large. The records of the Meat Inspection Division of the Bureau of Animal Industry show that in 1917 there were forty-nine thousand carcasses, (about half of one per cent) condemned or sterilized on account of

tuberculosis. In 1940 there were less than two thousand (less than 2 out of every 10,000). Traffic in purebred cattle is now under absolute control by adequate laws, and the hazard of dissemination of the disease is practically nil.

#### FOOT-AND-MOUTH DISEASE

Foot-and-mouth disease is one of the oldest animal plagues known. In earlier times it devastated herds over the whole of Europe. It spread generally from east to west, abating only after so many animals were lost that there were few susceptible ones left, then recurred when the susceptible population increased. In modern times the adoption of official regulations has caused it to spread more slowly and it has been held in check except in times of war, when livestock movement has been unrestricted. Its control is rendered extremely difficult because so many species of animals are susceptible. Cattle, hogs, sheep, and goats are particularly so, as are cloven-footed wild animals.

In the United States there were six outbreaks between 1902 and 1929. The most serious was the one of 1914-15. Just where the infection originated was never definitely determined, but circumstantial evidence pointed strongly to its introduction through importation of foreign cattle. In previous outbreaks of 1870, 1880, 1884, the disease had been traced to cattle imported from Europe, either directly or through Canada. Those of 1902 and 1908 originated from contaminated cowpox virus vaccine imported from Japan and used for the production of smallpox vaccine by a commercial laboratory.

The 1915 outbreak appeared first at Niles, Michigan, whence it spread to twenty-two states and the District of Columbia. Before it had been accurately diagnosed it had spread to thirty-nine herds in southern Michigan and seven in northern Indiana. On one farm in Michigan, hogs were fed milk from a creamery, contracted the disease and a carload was shipped to Chicago, establishing the disease in the Union Stockyards. From there it spread by livestock shipments to various localities. Its introduction into Iowa herds was traced to livestock shipped from the Chicago stockyards and to the use of hog cholera serum received from a plant operating in Chicago. Nine counties of the state were infected and it was found in forty-nine herds. These herds involved 1,547 cattle, 2,335 swine, and 32 sheep, all of which were destroyed at a cost of \$125,300 reimbursement to owners, plus \$1,330 for disinfection of premises, burial of animals, and destruction of property. This expense was shared equally by the State of Iowa and the United States Department of Agriculture. The first

case in Iowa was discovered November 5, 1914, and final disinfection was concluded March 22, 1915. By June 18, 1915, the eradication of the disease from the United States was completed. The total cost of ridding the country of the disease was enormous, as was the inconvenience to many livestock breeders, but the rigid treatment was certainly justified when it is realized that more palliative methods would not have succeeded and the disease would have become permanently established, as it is in many European and some South American countries.

#### HOG CHOLERA

Hog cholera has been the cause of enormous economic losses in the United States for more than a hundred years, amounting to as much as sixty-five million dollars in a single year. The first serious outbreak, recognized as such, occurred in Ohio in 1833. From there it spread to surrounding states and gradually to all hog-raising areas. Before its threat to the swine-raising industry was realized, it had become so general and so well established that no nation-wide effort was ever attempted to eradicate it. After the cause was discovered by scientists of the Bureau of Animal Industry, it was not long until a method of immunization was perfected. This proved effective enough to satisfy swine raisers, because, if properly used, it removed all danger of losses from the disease. So long as the present method of vaccination is used, however, there can be no hope of eradication of hog cholera, because it involves the use of the living filtrable virus. Newer methods of immunization which do not require the use of the living virus have been proposed, but they have not yet had sufficient field trials to warrant general adoption.

By 1893, hog cholera had become a serious problem in Iowa. The disease was particularly virulent and acute that year in the southern and southwestern parts of the state, entire herds being wiped out. No method of treatment either with drugs or by immunization had yet been developed. The only suggestion that could be given swine raisers was that there was no cure and the only hope was in prevention. The wave of cholera sweeping the state continued, reaching the peak in 1896, when the mortality reached the astounding height of 140 hogs of every 1,000 raised. Gradually the disease subsided and for fifteen years losses averaged about one-third as great. In 1913 another wave reached a peak of 100 hogs lost per 1,000. Fortunately, by this time a method of vaccination had been developed which reduced losses greatly. For the past thirty years, with the exception of 1926, losses

have been held at about 20 per 1,000. It can therefore be said that the disease is under fair, but far from complete control, without hope of eradication, and that increased control can come only from more universal vaccination.

Much of the fundamental work in the development of control measures and immunization has been done in Iowa. The discovery of the filtrable virus as the causative agent of the disease was made by scientists of the Bureau of Animal Industry working in Iowa. Dr. W. B. Niles, an Iowa State College graduate, Dr. Marion Dorset, and Dr. C. N. McBryde were sent to Page County in 1903 where there was much cholera. From experiments in the field, augmented by laboratory studies at Bethesda, Maryland, it was determined that a filtrable virus rather than a bacterium, previously incriminated, was the real cause. By immunizing swine by injections with this virus, a high degree of immunity was established and the blood serum from such animals would protect susceptible swine, when properly injected. In 1905, a laboratory for the production of hog cholera antiserum was established by the Bureau near Ames. The newly-discovered serum was used extensively on swine on farms in Story County. So successful were these trials that a meeting called at Ames in 1908 was attended by veterinarians and livestock officials from twenty-five states. Methods of preparing and administering the serum were demonstrated. A number of states set up laboratories and began production and distribution of serum to veterinarians and farmers. One of the first laboratories to follow was established by the state in Des Moines in 1910, and continued in operation for three years. In 1913, by action of the state legislature, the State Biological Laboratory was established at Ames and the equipment and personnel from the laboratory at Des Moines were moved. This laboratory continued producing serum for thirteen years, when commercial laboratories had increased sufficiently in numbers and efficiency to meet the demands for service.

In 1912, Dallas and Clay counties were selected by the Bureau for demonstration of methods of controlling hog cholera. The plan was to vaccinate all swine in the area, and to repeat the treatment year after year until cholera was no longer existent. Even had this been possible it is doubtful if the disease could have been eradicated, for when serum alone is used, the protection is short lived. When the so-called "double treatment" involving both serum and virus is used, the infection is maintained. It was impossible to obtain the co-operation of all farmers in the area so the experiment was really a test of the efficiency of vaccination. In this it was successful and demonstrated

that vaccination is a practical procedure, not for eradication but for insurance against loss.

Surveys made during the Dallas County campaign show that in 1913 there were 118,550 hogs raised in the county and that 324 outbreaks of cholera brought losses of 12,000 head. In 1914 there were 138,320 hogs raised with 302 outbreaks and 6,810 lost, or 5 per cent. In 1915 there were 124,500 hogs raised with 60 outbreaks and 1,240 lost, or 1 per cent. This remarkable reduction was due to vaccination, the cleaning and disinfection of stock cars, stock yards and equipment, proper disposition of dead animals, and moderate restrictions on the movement of livestock. Based upon hog prices at that time, the number of swine saved compared with the number that probably would have died had nothing been done, represents a saving in money of \$140,000. This demonstration gave great impetus to the practice of vaccination.

Efforts have been made by geneticists to build up by selection and breeding a strain of swine resistant to hog cholera, but the results to date offer little hope for success.

#### BANG'S DISEASE

Contagious abortion in cattle has been recognized in Europe as a serious problem for 150 years. It was not until 1895 that Doctor Bang in Denmark discovered its cause. Since then it has been known as Bang's disease, later as Brucellosis. Shortly thereafter it was recognized in the United States and has since become one of the most important diseases of cattle here, particularly of dairy stock. Through studies conducted by Doctor Traum, of California, it was shown in 1914 also to exist in swine. In southern Europe the most prevalent form of the disease in humans is acquired from goats. Later the United States Public Health Service proved it also was transmissible to man from both cattle and swine, and that the organism from swine produces a more serious disease in humans than the cattle organism. It is now recognized as a public health menace and its eradication is urgent.

Attempts to control or eradicate the disease have been made in this country for a good many years, but it was not until 1934 that efforts of federal and state governments were co-ordinated into an eradication campaign. Congress appropriated funds for reducing a cattle surplus. It was logical to direct part of the efforts toward elimination of diseased Brucellosis-cattle, so part of the appropriated funds were earmarked for this purpose. The plan outlined called for testing all dairy and breeding cattle in the United States over six months of age, all reactors to be condemned and slaughtered with compensation paid

owners. Iowa cattle owners accepted the opportunity with considerable enthusiasm and a Federal Bang's Disease Testing Laboratory was established at Ames. In seven years from 1939 on, the laboratory made more than a million and a quarter tests and retests. Some appreciable decrease in percentage of reactors resulted, but not as much as was hoped. Reports from individual herds where systematic testing has been carried on for several years were much more encouraging than those from a large area. This was also true in counties that have adopted area testing. Under such a plan, all cattle except steers and calves under six months of age are tested and the reactors are removed. Retests are made at proper intervals. Sanitary regulations are enforced through co-operative agreements with owners. Whenever all cattle in the county six months of age and over, except steers, show 1 per cent or less reactions, and the total number of herds showing reactors does not exceed 5 per cent, the county is rated as a "modified accredited Bang's disease-free area" for three years. All cattle in the remaining reacting herds are held in quarantine by federal and state officials and are retested at thirty- to ninety-day intervals until all pass two successive negative tests, with a third negative test not less than six months after the second. Two years after area testing was inaugurated, 15 per cent of all the counties in the United States were accredited. These were in twenty-three states. Most of these were counties having a high percentage of dairy cattle.

Dairymen reported 20-25 per cent better calf crops, marked decrease in udder troubles and sterility, increase in milk production, greater marketability of breeding stock with better prices because of increased demand for cattle from disease-free sources.

For many years scientists as well as cattle breeders have looked forward with hope to the development of an effective and safe method of vaccination against Bang's disease. Products proved objectionable or ineffective until the discovery of a *Brucella* organism of low virulence. This was nondisease-producing, and stimulating in its effect to produce immunity. After extensive tests with this product the Bureau recommended its use for calthood vaccination only. Calves between the ages of four and eight months were vaccinated and permitted to mingle with other members of the herd. Reactors were retained at first but later the practice was modified in favor of removal of all reactors as rapidly as replacements were possible from the matured vaccinated calves. Results of trials so far show that such control is effective in calf production, and equally effective in preventing infection. This plan has a strong appeal for cattle breeders. If results continue to be favorable the practice may be universally adopted.



## SLEEPING SICKNESS

In the fall of 1884, heavy losses of horses on the Missouri River bottom were reported. After investigation and feeding experiments it was decided deaths were due to consumption of "rattlebox" (*Crotalaria sagittalis*), which grew abundantly in some pastures in this area. From the symptoms and lesions described by Dr. Stalker it might now well be concluded that this was really an outbreak of sleeping sickness or encephalomyelitis, at that time and for a long time thereafter, unrecognized.

It was variously called sleeping sickness, brain fever, Nebraska horse disease, etc.—more properly equine encephalomyelitis. Not until 1930, however, was the cause and nature of the disease thoroughly understood. At that time a severe outbreak in California affected some six thousand head, killing half that many. This resulted in studies and discovery that the disease was caused by a filtrable virus and that it was spread by various biting insects, including the mosquito. In the next few years it spread gradually to other western states, reaching Iowa a few years later. Up to the present it is estimated that nearly a million horses and mules have been affected, with cases reported from nearly every state in the Union. The peak of the disease was reached in 1938 with an estimated loss of 184,000 head. The disease is fatal to at least 50 per cent of the animals attacked, so the desirability of perfecting an immunizing agent is apparent.

In the beginning various drugs were tried with little or no success. Then an antiserum was developed which proved fairly successful as temporary protection in some cases, but wholly inactive in many and of very doubtful curative effect. In 1934, scientists prepared a vaccine from the brain tissue of horses dead of the disease. This proved fairly satisfactory, but was objectionable because it was capable of producing the disease. Improvement upon this was made by adding formalin which killed the virus without destroying its immunizing properties. Further improvement came in 1938 when it was demonstrated that the virus could be cultivated in chick embryo. The virus-containing embryos are ground into a paste to which is added a chemical which inactivates the virus. The vaccine is thus made safe so far as disease production is concerned, and has proved very effective in use in the field.

The immunity established lasts for at least six months, so covers the current season of the disease. In infected areas it is therefore necessary to vaccinate annually. In Iowa vaccination is recommended in May and June, at least, since the season of outbreaks usually begins early in July and lasts until November. Vaccination has brought a

gradual decrease in incidence and mortality. In Iowa there were only 92 cases reported in 1944 compared with 1,097 in 1940. Practically all those lost had not been vaccinated.

#### AS IT LOOKS NOW

Great progress has been made in animal disease control in Iowa for the past sixty years, since the establishment of the State Veterinary Department. Glanders, dourine, foot-and-mouth disease, contagious pleuropneumonia, and Texas fever are completely eradicated, with no outbreaks occurring for many years. Anthrax and rabies are reduced to a minimum, with only isolated outbreaks reported for several years. Tuberculosis has been reduced to a comparative minimum, as is shown by the great reduction in percentage of cattle reacting to the tuberculin test and in the number of carcasses and parts condemned at packing houses under federal inspection. In 1917 when the tuberculosis eradication campaign was inaugurated, over 2 per cent of all cattle slaughtered at federally-inspected plants showed some evidence of tuberculosis. By 1941 the figure had dropped to 0.07 per cent. Likewise, the incidence of swine tuberculosis has been greatly reduced during the same period, with losses in packing plants dropping from 1.41 per cent to 0.16 per cent. Equine encephalomyelitis is quite successfully controlled by vaccination, with fair prospect of its eradication.

Hog cholera and Bang's disease are far from eradication, but a marked reduction has been obtained. So long as the present method of immunization against hog cholera is followed, the disease never will be eradicated. It can be and is controlled, however, and if all instead of a small percentage of pigs weaned were vaccinated, there would be much less of the disease than now occurs. So long as vaccination is voluntary on the part of swine raisers, there will be many who neglect this important procedure, at least until the disease is imminent in their territory, and this often is too late.

The program of calfhood vaccination against Bang's disease has been in operation too short a time to warrant drawing any final conclusion, but the success attending it thus far offers hope for eventual control, if not complete eradication.