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Brucellosis of Cattle

(Bang's Disease)

O. H. Muth



DISCARD

Oregon State System of Higher Education
Federal Cooperative Extension Service
Oregon State College
Corvallis

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RESULTS OF BANG'S DISEASE TESTING
STATE OF OREGON
BY YEARS

Year	Total number tested	Percentage reactors	Percentage positive reactors and suspects
		<i>Per cent</i>	<i>Per cent</i>
1929	45,562	.....	18.77
1930	75,615	.....	15.26
1931	68,906	10.74	.....
1932	58,955	9.84	.....
1933	52,552	9.21	.....
1934	95,486	7.88	.....
1935	395,470	6.48	.....
1936	379,776	4.39	.....
1937	299,540	3.21	.....
1938	361,582	2.63	.....
1939	361,144	1.52	.....
1940	297,957	1.23	.....
1941*	270,125	1.98	.....
1942*	192,365	2.18	.....
1943*	162,773	2.03	.....
1944*	214,080	2.07	.....
1945*	226,068	2.93	.....
1946	244,747	2.24	.....

* War years.

CATTLE POPULATION AND BRUCELLA TESTING IN OREGON FOR THE YEAR 1946

County	Cows (all)*	Cows milked*	Beef cattle*	Total tests†	Percentage reactors†
					<i>Per cent</i>
Baker	31,778	6,809	24,969	5,471	8
Benton	6,877	5,355	1,522	5,491	2
Clackamas	17,368	14,760	2,608	13,635	2
Clatsop	5,842	4,315	1,527	6,142	1.8
Columbia	10,670	8,426	2,244	10,676	2
Coos	18,739	15,221	3,568	14,203	4.67
Crook	19,213	1,701	17,512	443	1.6
Curry	4,139	2,232	1,907	2,766	.01
Deschutes	7,536	3,848	3,738	3,961	1
Douglas	12,295	7,507	4,788	8,078	.03
Gilliam	10,075	718	9,357	239	.03
Grant	26,835	1,861	25,024	628	4.8
Harney	40,395	1,054	39,341	734	3.5
Hood River	2,465	2,270	195	2,470	2
Jackson	22,413	9,573	12,840	13,297	1.7
Jefferson	7,253	495	6,758	351	4.7
Josephine	7,475	6,108	1,367	9,020	1.86
Klamath	29,090	4,927	24,163	3,060	4.8
Lake	37,661	1,694	35,967	1,687	7
Lane	20,810	13,268	7,542	16,892	1
Lincoln	6,466	4,412	2,054	8,674	.079
Linn	17,658	13,100	4,558	6,553	2
Malheur	56,925	12,076	44,849	4,473	3.9
Marion	20,844	18,714	2,130	17,797	1
Morrow	11,044	1,546	9,498	1,638	3
Multnomah	7,137	6,637	550	13,882	1.7
Polk	8,602	7,286	1,316	6,193	.08
Sherman	6,744	611	6,133	527	.057
Tillamook	16,708	16,082	626	19,374	4
Umatilla	22,744	7,507	15,237	6,612	6
Union	15,981	5,428	10,553	1,905	3
Wallowa	18,881	5,428	13,453	749	1
Wasco	12,741	1,900	10,841	1,767	.068
Washington	17,286	16,164	1,122	23,199	.08
Wheeler	7,635	788	6,847	545	.0368
Yamhill	12,701	10,625	2,076	11,515	.04

* Animals 2 years and over, U. S. Census 1945.

† State Department of Agriculture figures.

Brucellosis of Cattle

(Bang's Disease)

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A PROGRAM for the control and eradication of brucellosis of cattle has been in operation for many years in Oregon and much has been accomplished. Many cattle owners are familiar both with the disease and with the program. This circular is written to furnish information to those who wish to acquaint themselves with some basic facts concerning this disease.

Occurrence

This disease occurs wherever cattle have been kept in considerable numbers. It is most common in those areas of greatest cattle population and where there is much trading in cattle.

Importance

There is no disease of cattle in the United States more important from an economic viewpoint than brucellosis. Accumulated information shows that infected herds are as much as 30 per cent less profitable than clean herds. This figure is based on losses of calves, subnormal gains in beef calves, decreased milk production, and decreased sale value of infected animals. The federal and state governments are spending more money for the control and elimination of this disease than for any other animal disease occurring in the United States.

Cause

This disease is caused by the bacterium *Brucella abortus*. There are two closely related bacteria, *Brucella melitensis*, which is the cause of brucellosis of goats, and *Brucella suis*, which is the cause of brucellosis of hogs. All three of these organisms are capable of infecting several kinds of animals and any of the three may cause brucellosis (undulant fever) in man. *Brucella abortus*, the one that infects cattle, is the only one of the three common in Oregon.

Cattle infected

Cows and heifers of breeding age are most commonly infected. Bulls are sometimes infected. Until of breeding age, calves are very resistant and are seldom infected.

Organs infected

The pregnant uterus is the most favorable site of infection in the cow. Here the bacteria establish themselves, multiply to enormous numbers and live on the membranes which surround the calf and attach it to the uterus of the cow. If they damage these membranes sufficiently, nutrition to the calf is disturbed and abortion takes place. The milking udder also furnishes a desirable place for the infection. Approximately 50 per cent of infected cows have infected udders and the bacteria are shed with the milk. In the bull the testicles are sometimes infected.

Routes of infection

The most common way in which cattle become infected is probably by way of the mouth. Experiments have shown, however, that they can easily be infected by placing the causative bacteria in the eye. The bacteria are also capable of entering through the unbroken skin.

There is no evidence that infection is spread during the act of breeding. Attempts to infect heifers experimentally by breeding to infected bulls have been negative. Since there is a possibility of infecting cows and heifers in this manner, however, reacting bulls should not be used on negative cows and heifers.

Spread of infection

Most animals are infected by introducing an infected cow into a clean herd. Experience has shown that infected animals are always a dangerous source of infection. At the time of aborting or calving and for some time following, the discharges from the uterus contain large numbers of the causative bacteria and are especially dangerous. It is possible to spread infection through the use of contaminated feed sacks and other objects, such as the use of contaminated trucks and cars, corrals, yards, shovels, etc. Dogs may be a source of spread.

Viability of brucella bacteria

These bacteria do not usually live for a long period of time outside the animal body. They die within a few hours if exposed to bright sunlight or if they are dried. The bacteria are killed when exposed to pasteurization temperature (145° F. for 30 minutes). When protected from sunlight, kept in a damp place, and at about ice box temperature they may remain alive for as long as 100 days. Such conditions frequently occur in stables during the winter months. These bacteria are easily destroyed by the common disinfectants. A mixture of common lye (1 13-ounce can to 15 gallons of cold

water) is satisfactory for that purpose. Freezing does not kill the organism.

Incubation period

The incubation period is that period between the time of infection and the time at which animals become reactors. This varies from 14 to over 100 days. In some instances this period may be even greater. When the infecting dose is small the incubation period is greater than when the infecting dose is large. In other words when an animal picks up a few bacteria it will become a reactor considerably later than if it picked up many bacteria.

Symptoms

The act of aborting is the only easily recognized symptom. Most infected females abort only once, some abort several times, and some never abort. One is not able to tell until shortly before it occurs if any animal is going to abort. The act of abortion may occur any time from two to nine months after breeding. The fact that an animal aborts is not proof that it is affected with brucellosis—animals abort from other causes, including some other infectious diseases.

Herds affected with brucellosis usually have more breeding difficulties than clean herds and the retention of the afterbirth is common in infected animals.

Some cattle affected with brucellosis have sore and enlarged joints (arthritis) due to the localization of the infection in those regions.

The study of clean and infected herds has shown that mastitis is much more common in brucella infected animals than in animals free from this disease. While brucella bacteria themselves do not cause acute mastitis, they cause a chronic form of the disease which seems to prepare the udder for the establishment of the other bacteria which commonly cause mastitis. The result of these infections is that infected herds sometimes produce up to 50 per cent less milk than do noninfected herds.

Diagnosis

The blood agglutination test is the only reliable method of diagnosing brucellosis in cattle. For this test it is necessary to draw a sample of blood from each animal to be tested. Usually all cattle in the herd are tested at the same time as this gives a more complete picture of the status of each individual. The blood samples are taken to a laboratory where they are allowed to stand for some time in the refrigerator, or until some of the fluid portion of the blood

(serum) has separated from the clot. Measured portions of the serum are then mixed with measured amounts of a suspension of dead brucella bacteria (antigen). Three concentrations are usually made: 1:50, 1:100, 1:200. These mixtures are then allowed to stand in tubes for 72 hours, at which time they are examined. If the bacteria remain suspended the test is negative, indicating that the animal is *not* a reactor. If the bacteria have clumped together (agglutinated), and have settled to the bottom of the tube, the test is positive. In other words there has been a reaction in the tube, and the animal from which the sample was collected is marked on the test sheet as a reactor, indicating that it is infected with brucella bacteria. The so called "rapid" or "plate" test is similar to the test described above except that a somewhat more concentrated antigen is used and the test is made on a glass plate rather than in a glass tube.

A similar agglutination test is used in the official testing laboratories throughout the United States. With this arrangement, regardless of what state the animal is tested in, the results will be similar. Most of these laboratories are supervised by veterinarians of the Bureau of Animal Industry, U. S. Department of Agriculture.

The agglutination test is very accurate. Many herds, counties, and one entire state have been made modified accredited for brucellosis (less than 1 per cent infection) on the basis of this test. The laboratory at Oregon State College has conducted over 4,000,000 tests during the past 28 years.

While the agglutination test is very accurate it has its limitations. As stated previously, infected cattle do not react during the incubation period. There is no evidence that infected cows will react negatively at the time of calving. In other words they will not react to the test for some time after becoming infected. This is a fact to remember when purchasing cattle from infected herds and when attempting to clean up an infected herd.

Course of disease

A small percentage of animals spontaneously recover from the disease and cease to react to the agglutination test. This number is so small, however, that in a program of eradication it must be ignored.

Treatments

No drugs, including several of the newer antibiotics (sulfonamides, penicillin, etc.), have proved of value in the treatment of this disease up to the present time.

Control and eradication

Since no treatment has proved of value, the control and eradication of this disease are based on the protection of clean animals from infection and the detection and elimination of infected animals.

The most satisfactory procedure is to bleed the herd and make the agglutination test. Of course this should be supplemented by removal of the reactors and disinfecting of the premises, or removal of nonreactors to clean premises.

Experience has shown that in the case of herds which have been infected for a number of years, and in which the infection is not spreading rapidly, most or all of the infected animals react on the first test. The removal of the reacting animals from such herds will eliminate most or all of the infected individuals and retests will show the herd is clean or nearly clean.

Herds that have recently become infected and in which the infection is spreading rapidly will contain a number of animals which have only recently become infected, are in the incubation period of the disease, and do not yet react to the agglutination test. Such herds are somewhat more difficult to free from infection, and several retests with removal of reactors may be necessary before the herd is clean.

The practice of sanitation is very important in the control and elimination of this cattle disease. Owners should exercise every precaution to prevent clean cattle from coming in contact with other cattle that may be infected. The use of a common range or pasture by several owners is a frequent source of infection.

Cars and trucks used for cattle should be disinfected before transporting noninfected cattle, except when such cattle are transported for immediate slaughter.

The use of double fences will give some protection to clean cattle from infected cattle in adjoining pastures. Fences will not prevent contamination caused by surface drainage.

After the removal of reactors from a herd, the barns should be disinfected under the direction of a veterinarian trained in this work. Infected corrals and pastures should not be used by brucella-free cattle until such enclosures or premises have been exposed to bright sunlight and dry air for a period of at least 60 days.

Vaccination of calves

Brucella abortus B.A.I. strain 19 is used as a vaccine. Vaccination of calves between the ages of 5 and 8 months results in considerable protection to a high percentage of calves. Such vaccination, however, does not give complete and lasting immunity to the animals

as does the vaccination of calves for blackleg, or the vaccination of pigs for hog cholera.

Although calfhood vaccination has never been advocated by responsible persons, except as an *aid* in cleaning up badly infected herds, many have accepted it as the answer to the control program. Evidence has accumulated during the past several years which reveals the limitations of calfhood vaccination. It has been found that vaccination does not always protect against severe exposure and that the immunity acquired as the result of vaccination diminishes after the first year. The result is that mature cows vaccinated as heifers may become infected, may abort, and spread the disease in the same manner as animals that never were vaccinated.

Adult vaccination

Since calfhood vaccination does not give complete and permanent protection against infection, there has been some interest in adult vaccination. During the past several years the agricultural experiment stations and the Bureau of Animal Industry have studied this subject extensively and several objectionable features have been encountered.

To inform cattle owners about these problems and to protect them from the indiscriminate use of adult vaccination the 1945 Committee on Brucellosis of both the American Veterinary Medical Association and the U. S. Livestock Sanitary Association recommend that the following statement be *presented in writing* to all cattle breeders contemplating the use of adult vaccination in their herds:

1. Animals vaccinated as adults, when open, if they overcome the vaccination-reaction, acquire valuable protection. A high percentage, however, continue as persistent reactors. Some protection against actual abortion is provided even among those that continue to react.

2. There is no way of distinguishing between a vaccination-reaction and a reaction caused by exposure; hence, following vaccination of the adult herd, sanitary measures based on the agglutination test must be postponed indefinitely.

3. Raw milk from all reactors, vaccinated or not, represents a degree of danger to man; hence board of health requirements and attitudes, as well as the safety of the individual farm family are to be considered, prior to vaccination of dairy herds.

4. Failure to obtain beneficial results from the vaccination of adult animals is frequently due to a lack of good sanitation and provision for the isolation of infected animals at the time of

parturition. Intense exposure to infection can break down the acquired immunity.

5. Animals from reacting herds, vaccinated or not, sell at a disadvantage in their native states, and their interstate shipment is restricted or prevented altogether.

6. Vaccination of pregnant cows causes some abortions and the danger increases as pregnancy advances. Vaccination applied shortly before calving does not have time to produce actual abortion but uterine infection may take place.

7. Adult vaccination cannot be depended on to check the usual "abortion storm." It helps in some herds, it appears to help in others in which the storm already has spent its force, but it frequently fails completely.

8. Adult vaccination has a wider application in beef herds than in dairy herds, but the objections, except those relating to danger in milk consumption, apply to beef herds.

9. Eradication, or near eradication, of brucellosis will be delayed or prevented altogether by the extensive and indiscriminate use of adult vaccination.

Oregon state law prohibits the vaccination of adult cattle except by written permit from the State Department of Agriculture.

Strain 19 vaccine infective to human beings.

During the past two years there have been reports definitely establishing the fact that strain 19 vaccine is capable of causing typical brucellosis in human beings. Both the vaccine itself and animals inoculated with it must be considered as possible sources of infection to man.

Brucellosis and public health

The same bacterial infection (*Brucella abortus*) that causes brucellosis in cattle frequently infects human beings. In man the disease is known as brucellosis (undulant fever). Human beings become infected by contact with infected animals, or parts thereof, and by consuming infected dairy products.

Since farmers, ranchers, meat packing plant workers, and veterinarians have frequent contact with infected animals and carcasses, the disease is most common among these groups of people. While the pasteurization of milk from infected cows gives protection to the dairy product consuming city dweller, only the elimination of the disease will protect those who must have contact with animals.

Status of the federal-state campaign in the United States

It was estimated from the more than 3 million tests made in 1934-35 that about 10 per cent of the female cattle of breeding age in the country were infected. The almost 7 million tests made in 1939-40 indicated that the percentage of infected cows and heifers had been reduced by more than half. There were 346 accredited counties at this time. These represented more than 11 per cent of all our counties and contained about 6 per cent of all our female cattle of breeding age. Total beef production in the country had increased by a little more than 7 per cent, total milk production had gone up about the same percentage, and average butterfat production per cow had risen to an all-time high of 182 pounds annually.*

The number of accredited counties reached a high of 583 in 1943, but with the ever-increasing scarcity of personnel it was impossible to maintain this level. In September of this year, 1946, 528 counties remained on the accredited list. Slightly less than 5 million official tests were made in the year ended June 30, 1946. This is a decrease of nearly 40 per cent from the high of a little above 8 million in 1938. In some states it seemed advisable to concentrate field work in herds and areas in which there was definite evidence of the disease. This resulted in a marked decrease in retesting of clean herds. Consequently, percentages of reactors obtained in the last 3 or 4 years are not strictly comparable to those of prior periods. From the figures available it seems true that nearly 5 per cent of our female cattle of breeding age are still infected. While this regression during the war period is disappointing, it should not be the cause of too much discouragement. In this connection, attention is called to a similar regression in the tuberculosis eradication program. The percentage of cattle which reacted to the test increased by more than one fourth between 1943 and 1946.*

During this second 6-year (1940-1945) period the number of cattle in the country increased materially, total beef production increased over 20 per cent, total milk production increased about 11 per cent, and the average butterfat per dairy cow will probably be about 193 pounds this year, again an all-time high.*

The average butterfat production per cow per year for the three years 1932-34 was 164 pounds. This rose to an average of 185 pounds for the years 1943-45. The average increase per cow was 22.5 pounds per year in the 23 states in which official records showed the greatest decrease in percentage of brucella-infected cattle, while it was only 16.7 pounds for the 23 which showed the least decrease in percentage of reacting cattle. In 2 states there was insufficient testing to obtain a reasonably accurate estimate of the percentage of infection. It is realized that the brucellosis testing records include only a portion of the cattle in each state, but it is believed that they are sufficiently voluminous in these 46 states to be fairly accurate.*

Brucellosis program in Oregon

Chapter 355 Oregon Laws 1945 amended 1947 is now the basis for the control and eradication of brucellosis in this state. The Oregon State Department of Agriculture, in cooperation with the U. S. Department of Agriculture, Bureau of Animal Industry, is

* Report on the Cooperative Brucellosis Control and Eradication Program, by B. T. Simms, Chief, Bureau of Animal Industry, presented at the 50th annual meeting of the United States Livestock Sanitary Association, Chicago, Illinois, December 6, 1946.

charged with the administration of that and other laws pertaining to the control of brucellosis in livestock. This is accomplished through county, state, and B.A.I. veterinarians.

There are at present 45 county veterinarians serving 24 counties. In addition there are 15 B.A.I. veterinarians. They are stationed in some of the above 24 counties and some of them are stationed in additional counties. B.A.I. veterinarians are not confined in their practice to the counties in which they are stationed and may test in counties as directed by their chief.

SOME PROVISIONS OF OREGON BRUCELLOSIS LAW CHAPTER 355 OF INTEREST TO ALL CATTLE OWNERS:

1. Official testing and vaccination shall be done by county, state or B.A.I. veterinarians.
2. All female cattle and bulls over 6 months of age must be tested at least once a year. (Beef cattle are exempt from testing, except that, following petition and hearing, a county court may declare that all cattle in all or part of county must be tested.)
3. If infection is found in the herd, reactors must be removed and retesting will be done as determined by an official veterinarian until the herd is pronounced clean.
4. Owner shall elect one of the following programs:
 - I. Test and slaughter of reactors.
 - II. Test and slaughter of reactors and vaccination of calves between ages of 5 and 8 months.
 - III. Test and vaccination with retention of reactors. (This option will expire November 1, 1947.)
5. If requested by the county court a program of calf vaccination without testing may be employed in beef herds.
6. No animals shall be added to any herd except from a disease-free herd.
7. Vaccination of mature cattle is prohibited except by written permission from Oregon State Department of Agriculture.
8. Beef cattle not officially tested must be so kept as to prevent co-mingling with tested cattle.
9. Dairy cattle must be tested and proved free from brucellosis before allowed to run in community pastures.
10. Reactors shall be slaughtered and indemnity shall be paid if the owner has properly cleaned and disinfected the infected premises, and complied with all other requirements of the law.

Of special interest to beef cattle operators

Oregon's brucellosis control law does not provide a program for beef cattle operators, except where beef cattle come under the provisions of the law by petition. This leaves a considerable portion of the state without organized supervision. Naturally problems will arise among individual operators of beef cattle in the range areas where official veterinarians are not stationed.

To provide assistance to beef cattle operators who have special problems in the above mentioned areas, the State Department of Agriculture has organized an advisory committee which includes in addition to its own representatives, those from the U. S. Bureau of Animal Industry and the Oregon State College. When requested the committee will give advice and assistance concerning control measures. This committee will also serve as a source of information and advice on other problems concerning brucellosis control and elimination which are not specifically provided for under the present law. The committee has already made the following recommendations of particular interest to beef cattle operators:

1. Where the law does not provide a program, all beef-type heifer calves run on the open range should be vaccinated for brucellosis.
2. Requests for adult vaccination will be considered individually by the committee.
3. All brucellosis vaccinating should be done by licensed, accredited, approved veterinarians.

For full details see Chapter 335, Oregon Laws 1945, as amended by Chapter 588, Oregon Laws 1947, Relating to Control and Eradication of Brucellosis in Cattle. For further information concerning the program consult the veterinarian in your area who is authorized to do this work or the State Department of Agriculture, Division of Animal Industry, Salem, Oregon.