

Brucellosis of Cattle

(*Bang's Disease*)



by

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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* | 192,865 | 2.18 | ----- |
| 1943* | 162,773 | 2.03 | ----- |
| 1944* | 214,080 | 2.07 | ----- |
| 1945* | 226,068 | 2.93 | ----- |
| 1946 | 244,747 | 2.24 | ----- |
| 1947 | 272,290 | 2.23 | 5.31 |
| 1948 | 246,437 | 2.23 | 4.91 |

* War years.

~~2.39~~

Official

Correction

CATTLE POPULATION AND BRUCELLA TESTING IN OREGON FOR THE YEARS 1947 AND 1948

| County | Cows (all) ¹ | Cows milked ¹ | 1947 | | 1948 | |
|------------|-------------------------|--------------------------|--------------------------|----------------------------------|--------------------------|----------------------------------|
| | | | Total tests ² | Percentage reactors ² | Total tests ² | Percentage reactors ² |
| Baker | 31,778 | 6,809 | 1,533 | 3.8 | 5,037 | 6.3 |
| Benton | 6,877 | 5,355 | 7,218 | .1 | 6,159 | .2 |
| Clackamas | 17,368 | 14,760 | 13,558 | .3 | 11,879 | .4 |
| Clatsop | 5,842 | 4,315 | 6,459 | .1 | 7,161 | .2 |
| Columbia | 10,670 | 8,426 | 8,159 | 2.7 | 9,017 | 1.5 |
| Coos | 18,789 | 15,221 | 15,951 | 3.3 | 18,047 | 5.3 |
| Crook | 19,213 | 1,701 | 717 | 1.8 | 1,961 | 1.3 |
| Curry | 4,139 | 2,232 | 701 | .3 | 3,238 | .2 |
| Deschutes | 7,586 | 3,848 | 4,284 | 1.3 | 3,747 | .7 |
| Douglas | 12,295 | 7,507 | 6,343 | .3 | 6,999 | .4 |
| Gilliam | 10,075 | 718 | 149 | 1.3 | 408 | 2.2 |
| Grant | 26,885 | 1,861 | 466 | 6.4 | 922 | 4.1 |
| Harney | 40,395 | 1,054 | 638 | 1.7 | 1,363 | 1.8 |
| Hood River | 2,465 | 2,270 | 2,124 | 1.1 | 1,897 | 1.7 |
| Jackson | 22,413 | 9,573 | 6,757 | 1.1 | 12,976 | 2.5 |
| Jefferson | 7,253 | 495 | 603 | 3.2 | 339 | .9 |
| Josephine | 7,475 | 6,108 | 5,422 | 1.2 | 7,217 | 2.3 |
| Klamath | 29,090 | 4,927 | 2,296 | 2.7 | 2,845 | 3.2 |
| Lake | 37,661 | 1,694 | 1,121 | 5.9 | 323 | 6.5 |
| Lane | 20,810 | 13,268 | 5,142 | 1.0 | 15,086 | .7 |
| Lincoln | 6,466 | 4,412 | 5,814 | 1.8 | 4,022 | 3.5 |
| Linn | 17,658 | 13,100 | 6,059 | .4 | 9,681 | .5 |
| Malheur | 56,925 | 12,076 | 5,028 | 4.9 | 5,764 | 3.2 |
| Marion | 20,844 | 18,714 | 22,003 | .8 | 22,199 | .6 |
| Morrow | 11,044 | 1,546 | 267 | 9.4 | 1,670 | 4.1 |
| Multnomah | 7,187 | 6,637 | 8,486 | 1.1 | 10,924 | 2.0 |
| Polk | 8,602 | 7,286 | 6,548 | .4 | 8,271 | .4 |
| Sherman | 6,744 | 611 | 188 | 5.9 | 445 | .2 |
| Tillamook | 16,708 | 16,082 | 25,449 | 3.9 | 24,337 | 6.1 |
| Umatilla | 22,744 | 7,507 | 4,458 | 1.6 | 6,357 | 2.4 |
| Union | 15,981 | 5,428 | 1,894 | 2.9 | 1,456 | 4.5 |
| Wallowa | 18,881 | 5,428 | 488 | 7.4 | 1,583 | 8.7 |
| Wasco | 12,741 | 1,900 | 1,652 | 2.5 | 1,583 | 3.2 |
| Washington | 17,286 | 16,164 | 19,649 | .6 | 19,025 | .9 |
| Wheeler | 7,635 | 788 | 177 | .6 | ----- | ----- |
| Yamhill | 12,701 | 10,625 | 6,873 | .6 | 11,112 | .8 |

¹Animals 2 years and over, U. S. Census 1945.

²State Department of Agriculture figures.

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Brucellosis of Cattle

(*Bang's Disease*)

O. H. MUTH, Veterinarian

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 evidence that infection is sometimes spread during the act of breeding by some infected bulls. Since there is a possibility of infecting cows and heifers in this manner, 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 30 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

(For additional information concerning range and semi-range cattle, see page 12.)

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 con-

siderable 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

" . . . the degree of infection showed a slight reduction from the 5 per cent disclosed during the fiscal year 1946, which was the highest during the last 10 years. During the year, 5,434,792 blood tests were applied to cattle in 533,936 herds. Many of these represent retests of the same herds. Of the cattle tested, 232,199, or 4.3 per cent, were reactors. This figure includes 68,653 reactors, temporarily held in herds practicing calfhood vaccination, for which no Federal indemnity will be paid.¹

"At the close of the year (1948), 480 counties, located in 21 States, were qualified as modified accredited areas, indicating that not more than 1 per cent of infection existed in the cattle in such areas on the last complete test, and herd infection did not exceed 5 per cent. There has been a great demand for work under the area plan and, notwithstanding the fact that North Carolina is still the only completely accredited State, the remaining nonaccredited counties in several other States are working toward that accomplishment.¹

"Practically all States have a plan for accrediting individual herds as brucellosis-free. At the close of the year, 45,100 herds, containing approximately 880,400 cattle, had so qualified. Approximately 2,292,000 herds, containing about 18,130,000 cattle, were under official supervision for the eradication of this disease, while about 3,107,000 additional cattle in 19 States were on the list waiting to be tested. A considerable part of this demand is due to the desire of owners to have their herds tested because of the danger of using unpasteurized dairy products which may cause undulant fever in humans.¹

"*According to reports of brucellosis-eradication work from all States, more than 80 per cent of the herds in the United States are free of brucellosis. Of nearly 5½ million cattle tested during the year there were less than 233,000 reactors or 4.3 per cent.*"¹

Brucellosis program in Oregon

Chapter 355 Oregon Laws 1945 amended in 1947 and 1949 is now the basis for the control and eradication of brucellosis in this state. The Oregon State Department of Agriculture, in cooperation

¹Report of the Chief of the Bureau of Animal Industry, Agricultural Research Administration, 1948.

with the U. S. Department of Agriculture, Bureau of Animal Industry, is 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 55 county veterinarians serving 26 counties. In addition there are 14 B.A.I. veterinarians. They are stationed in some of the above 26 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.

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.

For full details see Chapter 335, Oregon Laws 1945, as amended by Chapter 588, Oregon Laws 1947 and by Chapter 449, Oregon Laws 1949, 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 Industries, Salem, Oregon.

Control in beef cattle

In a program for control and eradication of brucellosis in beef cattle, the program should be adapted to management practices. Where the cattle are managed under farm conditions the same methods as are used for dairy cattle or applicable.

Where beef cattle are run on dry range throughout the entire year and are not fed, brucellosis does not seem to be a serious economic problem except where they may constitute a hazard to other clean cattle.

Most of the beef cattle in Oregon are managed under what is known as semi-range conditions in that they are concentrated and fed during the winter months. Cattle managed under such conditions occupy an intermediate position as compared with dairy and range cattle.

Under semi-range conditions a program of calfhood vaccination coupled with testing and removal of reactors appears to be most practical at the present time. In clean herds on isolated range where there is no opportunity for exposure, calfhood vaccination may be omitted. Where it seems impractical to the owner to test at the present time, vaccination of calves will give some protection.

A short breeding season so that the calves are all dropped within a 60-day period is considered by some to be the most important practice in a beef cattle control program. This is also considered good general herd management. Where such a breeding program is practiced and all calves are dropped before June 15, those cattle which become infected during the last feeding period will have had time to become reactors and can be eliminated at shipping time when they are at their greatest value for slaughter.

Testing should be done after gathering in the fall and before cows have aborted and spread infection in the feed lot.

Since the value of grade beef cattle as breeding stock does not greatly exceed their slaughter value it is suggested that in a control program suspects as well as reactors be eliminated from the herd.

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.

The agencies responsible for the administration of the brucellosis program in Oregon have made the following recommendations which are 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 (range used by two or more operators) should be vaccinated for brucellosis.
2. Requests for adult vaccination will be considered individually.
3. All brucellosis vaccination should be done by licensed, accredited, approved veterinarians.

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