

The Establishment and Maintenance of Herds of Cattle Free from Bang's Disease

(Infectious Abortion)

By

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SUMMARY

1. Bang's disease is a widespread, serious malady among Oregon cattle.
2. The germs causing this disease are spread by infected cows and heifers at the time of calving or aborting and for a few weeks thereafter.
3. Cows and heifers more than five or six months old become infected mainly through eating feed which has been contaminated with Bang's disease germs.
4. Symptoms include abortion, retained afterbirths, shy breeding, sterility, garget, enlarged joints, and decreased milk production; but some infected animals show none of these symptoms.
5. Serious economic losses are caused by Bang's disease.
6. The blood test is a reliable method of diagnosis.
7. The disease can be eradicated by:
 - (a) Testing the entire herd and removing all reactors.
 - (b) Cleaning and thoroughly disinfecting the barn.
 - (c) Retesting every 30 to 60 days until the herd has passed at least two successive clean tests.
8. Herds free from Bang's disease are being maintained in Oregon by preventing any exposure to infected or untested cattle.

The Establishment and Maintenance of Herds of Cattle Free from Bang's Disease (*Infectious Abortion*)

By

B. T. SIMMS and O. H. MUTH*

INTRODUCTION

FROM the time the Department of Veterinary Medicine was first established at the State College, in 1913, Bang's Disease, or infectious abortion, has been recognized as the most serious of the contagious troubles affecting Oregon's livestock. The first experimental work of the department, started in 1915, was a study of methods of spread of this disease. Since that time studies of Bang's disease have been under way continuously at the Station.

At a meeting of the Oregon Dairy Association at Hillsboro, Oregon, in January, 1919, it was announced that the following facts concerning Bang's disease had been established through work at this and other stations:

(1) The disease is widespread in Oregon and in all other sections of the United States where dairying is an important farm enterprise.

(2) Nearly every serious outbreak of abortion in Oregon is caused by this disease, but occasionally individual cows that are free from this trouble lose their calves.

(3) Infected cows may give birth to live calves and at the same time act as spreaders of Bang's disease.

(4) Infected cows and heifers are the principal sources of the infection.

(5) The germs that cause the disease live in the udder and in the pregnant uterus.

(6) The disease is not usually spread by the bull at the time of service.

(7) Heifers born from infected dams do not inherit the malady.

(8) The feeding of infected milk to heifers under five months old does not result in permanent infection in these calves.

(9) The agglutination test is a reliable method of diagnosis.

(10) No medicinal cure for the disease has been found.

(11) Reacting cows and heifers usually continue to react.

*F. W. Miller, resigned in 1925, C. R. Donham, resigned in 1929, and A. M. McCape^s resigned in 1931, assisted materially in these studies.

With these facts as a basis it seemed possible to work out practical methods of controlling and eradicating the disease. Opportunity to develop such methods came as a result of an appropriation for the "study of diseases of cattle and other dairy problems" which was secured from the 1919 session of the Oregon legislature by the legislative committee of the Oregon Dairy Association.

The first field experiments were started in March of that year. As time passed and additional knowledge of the disease was gained, the amount of work with herds under actual farm conditions was increased. For the first two years these studies were made with purebred herds located within easy reach of the State College; but later the program was expanded to include at least a few herds in every section of the state in which there is a considerable dairy industry. This bulletin discusses the available knowledge concerning Bang's disease, and outlines the methods of control and eradication that are being used successfully on hundreds of Oregon farms.

THE CAUSE

The cause of Bang's disease was discovered by a Danish veterinarian, Dr. Bang, in whose honor the malady has been named. The germ has been called by several different names but is now generally known as *Brucella abortus*. Two other micro-organisms belonging to the *Brucella* group are very similar to this one. They are *Brucella suis*, a form which has been shown to cause abortions in hogs, and *Brucella melitensis*, a form found in goats. The *abortus*, or cattle type, is widespread in Oregon. It is the only one of the three that causes natural outbreaks of abortion among cattle. It does not seem to attack either hogs or goats under natural conditions, but has been found in horses occasionally. The *suis*, or swine type, seems to be unimportant in this state. While a few herds of hogs which are infected have been found, swine abortion has not been widespread. The *melitensis* or goat type has not been found in Oregon.

All three types may attack human beings and produce the disease known as brucellosis or undulant fever. This malady has been recognized in Oregon for the past several years. During the past six years about 25 cases each year have been diagnosed by physicians of Oregon. While the death loss from brucellosis in human beings is very low, an attack produces a very serious illness.

None of the three types of *Brucella* will grow outside an animal's body except in special surroundings such as may be had in a laboratory. But under favorable circumstances, such as the presence of moisture and the absence of sunlight, the germs may live in barns, pastures, or corrals for several months. They are not destroyed by freezing.

Exposure to bright sunlight and dry air results in death of these bacteria in a few hours. The commonly used antiseptics and disinfectants destroy the *Brucella* bacteria quite satisfactorily. In milk they are killed by the accepted methods of pasteurization.

METHODS OF SPREAD

The principal source of the spread of the disease is the infected cow or heifer at the time of calving or aborting and for a few weeks thereafter. The germs, living in the placenta or afterbirth, increase to untold numbers

by the time the pregnancy is terminated. They escape in the discharges that are expelled at the time of the expulsion of the calf. The number of organisms in the discharges decreases rather rapidly, so that after two to four weeks very few abortion germs are being thrown off. At the end of two or three months the womb or uterus is usually free from these bacteria.

Cows that have the *Brucella* organisms in their udders secrete milk that may contain these germs. Such milk may be a source of the disease.

While bulls are sometimes infected, it is quite unusual for the germs to escape from their bodies. In experiments conducted at the Oregon Agricultural Experiment Station infected bulls have consistently failed to spread Bang's disease.

The usual route of entry of the germs into the body is through the mouth. While calves under five months of age may be given infected feed without causing a permanent infection, the use of such feed for any animals older than six or eight months is dangerous. Stanchions, stalls, barns, corrals, or pastures which have been contaminated with abortion bacteria are very dangerous sources of infection. In some instances the use on pastures of manure from infected cows and from pigs and young calves being fed infected milk has resulted in the appearance of Bang's disease.

SYMPTOMS

The symptoms of this malady are well known to most dairymen. They include abortion or premature birth, retained afterbirth, shy breeding or sterility, mastitis or garget, enlargement of one or more joints, and decreased milk production.

Most of the abortions occur in the latter half of pregnancy although they may take place within 60 days after conception. If the abortion occurs early in pregnancy, there may be no warning symptoms. Those cows and heifers aborting during the last two or three months usually make some udder and show some swelling of the vulva a few hours before the calf is dropped. There is nothing typical about the appearance of an aborted calf to enable a veterinarian to be sure that Bang's disease is present.

Retained afterbirths, shy breeding and sterility, garget, and enlarged joints are all seen in cows that do not have Bang's disease. While the occurrence of any of these symptoms may cause a suspicion of the presence of infectious abortion, a definite diagnosis can not be made on the basis of the appearance of any of these abnormalities. Many cows infected with Bang's disease give birth to live calves, do not retain afterbirths, breed regularly, and produce normal-appearing milk. Such animals which show no symptoms may be very dangerous sources of the infection.

ECONOMIC LOSSES FROM BANG'S DISEASE

Two previous bulletins from this station (Nos. 192 and 232) have pointed out the losses that result from this disease. More recent observations and studies have supported the statements made in these publications. The following conclusions are based on results of these studies.

Infected cows give birth to fewer live calves. The percentage of abortions among infected cows has varied from almost none to as high as

ninety. Many factors seem to influence this. Among them may be mentioned the age of the animals, the severity of the exposure, the type of the germs to which the animals are exposed, and the length of time that has passed since exposure. Young cows abort a much higher percentage of their calves than do old animals. Cows that are very severely exposed apparently abort more frequently than those that are only slightly exposed. In some outbreaks the germs seem particularly severe, and the percentage of abortions is very high. Data accumulated at this Station, covering several herds for a period of five years, gave an average of approximately one abortion in each three pregnancies in the infected cows and heifers.

The monetary loss from abortions naturally depends upon the value of the calves. In purebred herds the calves may be quite valuable. In some dairy herds producing market milk the value of the calves is negligible.

Infected cows give less milk. It has long been known that cows that abort do not give the full flow of milk. Studies previously reported from this Station have shown that abortion-reacting cows secrete less milk even when they give birth to live calves. In unculler herds that have been studied, the reacting group has produced only about 75 to 80 per cent as much milk as the abortion-free group. This constitutes the most serious economic loss from Bang's disease.

Infected cows have more breeding trouble. Difficult breeding and sterility have been much more prevalent among abortion-infected cows than among abortion-free cows. The result has been more severe culling because of sterility, more frequent bull service per calf, and longer periods between pregnancies.

Infected cows have more garget. From 30 per cent to 60 per cent of the infected cows carry the germs of Bang's disease in their udders. While this does not result in acute inflammation of the udder, it does seem to make the udder more susceptible to infection with other germs, causing garget. A very striking result that has come from removing reactor cows from their herds has been the low percentage of cows with diseased udders left in the free group. In two different herds which were under observation for several years, there were approximately five times the percentage of garget among the infected animals as among the disease-free cows.

Infected cows have more enlarged joints. In a previous publication, chronic enlargement of one or more joints of the limbs was reported as occurring among abortion-infected cows in the college herd. At that time the abortion germ had not been found in any of these enlarged joints. Since then veterinarians at the Minnesota station have shown that the Bang's disease organism is present in at least some of these enlarged joints. Following their reports, this germ was found in the joints of cows infected with Bang's disease at this station.

Surplus stock from infected herds have lower sales value. During recent years dairymen and breeders of dairy cattle have realized the importance of herds free from Bang's disease and have refused to buy reacting cattle. In many instances they have refused to purchase from herds that contain reactors. This has resulted in a considerable difference in sales value between the surplus stock of disease-free herds and the surplus of infected herds.

METHODS OF DIAGNOSIS

Since there are no symptoms which occur in every cow infected with Bang's disease, veterinarians and laboratory workers have had to develop a laboratory test for this malady. The agglutination test has been in very general use for the past fifteen years. The laboratory of the Veterinary Medicine Department of the State College has conducted nearly half a million of these tests. Many thousands of these tests were made with blood samples from cows under carefully controlled conditions. While it is not claimed that this test is absolutely perfect, the results of the studies conducted here, as well as of those made in other laboratories throughout the world, prove conclusively that the agglutination test for Bang's disease is a very accurate method of determining whether cows and heifers are infected with the germs of this malady. The test will not determine whether an individual cow will abort. If it detects only the aborting animals it will be useless in any disease-eradication program, because many infected cows which give birth to live calves are serious spreaders of the disease.

The agglutination test will not detect very recent infections in cattle. In experimental exposures of cattle, some animals have reacted as early as the twentieth day, while others have failed to react until about the end of the third month. It should be recognized, therefore, that a single negative test of an animal which has recently come from an infected herd does not necessarily prove that the animal is free from the infection.

Occasionally a reacting cow or heifer will fail to react just at the time of aborting or calving. Consequently, negative tests obtained at this time are not definite proof of the absence of the disease.

REACTING ANIMALS CONTINUE TO REACT

Among the first experiments in attempts to establish herds free from Bang's disease were studies for the permanency of the reaction. In this experiment, animals whose breeding histories were known and which were reactors to the test were held as a group and tested at monthly to semimonthly intervals. These consisted of cows and heifers of all ages, from slightly more than two years to more than ten years. They were fed, cared for, and handled in a way comparable to the usual practices followed by dairymen in Western Oregon.

Some animals in the groups were on pasture during the pasture season while others were kept in corrals most of the year. The animals kept in corrals received a considerable amount of green forage as part of their diet.

These experimental animals consisted of three different groups. The first group included cows and heifers that were milked and bred according to usual dairying practices. The second group included animals that were milked but were not bred. The third group included those that were neither milked nor bred.

The two groups last mentioned were included in the experiment in order to determine whether animals will cease to react if either or both the uterus and the udder are in a resting condition.

In all three groups the reacting animals usually continued to react. Occasionally, however, reactors gradually changed to non-reactors. Such animals usually became suspects and remained such for from several weeks to several months. Some of these cases would change back and forth at succeeding tests, being suspects, light reactors, and suspects again; then suspects, non-reactors, and suspects again, until finally they remained non-reactors. A few cows were observed to drop to suspects and then become reactors again. Such animals continued to react over long periods.

It was apparent from these observations that the only sound procedure in controlling the disease must be to consider all reacting animals as being probably permanently infected, because the percentage of those which changed to non-reactors was too small to be considered in any disease-control program.

ESTABLISHING HERDS FREE FROM BANG'S DISEASE

If the methods of spread and an accurate method of diagnosis of a disease are known, plans can be developed for the control of the trouble. The fundamental basis of all disease-control work is prevention of exposure of susceptible animals to the cause of the disease. In the case of Bang's disease, the detection of infected animals by the agglutination test and the prevention of exposure of susceptible animals to the infected ones has resulted in control and eradication in many Oregon herds. The application of the principles involved naturally varies according to conditions existing on the farms on which control work is being done.

Three general methods of controlling eradication are being used; the two-herd system, the modified quarantine system, and the immediate disposal system.

The two-herd system. This system consists in testing the entire herd, and separating the reactors from the non-reactors. The reacting group is kept in separate quarters with different pastures and corrals, and is handled as an entirely separate unit. The barn equipment used in the care of the infected herd—such as forks, wheelbarrows, brushes—is not to be taken into the barn where the disease-free group is kept. If possible, the caretakers handling the infected group should not come in contact in any way with the healthy animals.

Calves born from the infected animals are isolated in a separate barn until they are at least three months old. After the first three days, when they are taken away from their dams, they are fed milk from the abortion-free herd and are allowed no contacts whatsoever with the infected groups. At the end of three to four months they are given an antiseptic bath and removed from the quarantine pens where they have been held. At this time they may be placed with the calves from the disease-free group. As previously reported, this method of handling heifers born from infected dams was used in establishing an abortion-free herd at the State College. It has been adopted on many other farms in Oregon, and in no instance has there been any evidence that these heifers carried the disease to the disease-free animals.

In from two to three years it is usually possible to raise enough replacements so that the infected animals can be sold from a herd without ser-

iously decreasing the number of cows and heifers in production. The two-herd system is expensive and troublesome, however, and is usually adopted only on farms where purebred cattle of very considerable value are being raised. In some instances, where valuable cows were infected, it has been possible by following this system to preserve their blood lines and establish abortion-free herds.

The modified quarantine system. This method consists in maintaining the profitable reacting animals on the premises and attempting to prevent spread of the disease to the clean cattle. Such reactors are kept until the required number of heifers have been raised to serve as replacements. Under this program it is to be expected that there will be some spread of the disease to the clean group. The amount of spread depends to a very considerable extent upon the efforts of the caretakers to protect the disease-free cattle from exposure. It is necessary to test all of the disease-free cattle at very frequent intervals in order to detect any recently infected animals before they become serious spreaders of the disease.

On some farms, the owners have found it possible to place the reacting group in a separate room of the barn, thus cutting down the amount of exposure to which the abortion-free animals are subjected. On other farms it has been necessary to keep the reactors in the same barn with the clean cattle. Where this is done, the reacting group is placed at an end of the barn where the drainage in the gutter is toward the reactors. In handling cattle, the abortion-free animals are always handled first. The caretakers are always instructed to wash their hands thoroughly immediately after working with the infected group.

The manure from the infected animals is a serious source of danger. It should never be spread on any pastures which are to be used by the abortion-free group.

It has been found that results are better if the reacting animals are not allowed to run in any corrals or pastures that are being used by the clean cows and heifers. In some barns the reactors have been kept in the stanchions at all times, while on other farms a separate corral or pasture has been provided for this group of animals.

On farms where the modified quarantine system has been employed, it has required from two to three years to develop enough heifers to replace the reacting animals. In most instances the system has been fairly successful provided the owners and caretakers were careful at all times. Occasionally, however, there have been instances of disastrous results following the intermingling of the infected and the disease-free cows in pastures or corrals as the result of a gate having been left open or a fence having been broken through.

While this method does not give as good results as the two-herd system, it is applicable to many more farms. It has been used with success on practically every type of dairy farm in Oregon.

A slight modification of this system has been employed on a number of dairy farms which are producing whole milk and raising calves. On these premises, the reacting cows have been held in the herd without being bred. Such animals may give a good flow of milk for 12 to 24 months. As soon as they become unprofitable milk producers, they are sold to the butcher.

The immediate disposal system. This method consists in testing the entire herd and removing the reacting animals from the premises immediately. Just as soon as this is done the barn is thoroughly cleaned and disinfected so as to destroy any abortion germs that may be present. A retest of the entire group of disease-free animals is made at thirty- to sixty-day intervals until the herd has passed at least three successive tests.

The percentage of reactors which will be found at the successive tests and the length of time necessary to eradicate the disease by following this method, depend very largely on the amount of infection in the barn and on the premises, and the thoroughness of the disinfection. It should be recognized that at least a few of the cows which pass the first test, and are kept as clean animals, have already been exposed to the disease and are consequently carrying the germs. These cows will react on later tests. By testing the herd frequently, such animals can usually be detected before they become spreaders of Bang's disease. If infected animals have been kept in corrals or pastures that must be used by the abortion-free group, at least a few new reactors will usually be found which have become infected from the corrals or pastures.

This method has given the best results in controlling and eradicating Bang's disease. It is the one usually recommended for herds containing not more than 20 per cent of reactors. In some instances it has proved to be the most practical procedure, even when the percentage of reactors was quite high.

MAINTAINING A HERD FREE FROM BANG'S DISEASE

After an abortion-free herd is established, the problem of preventing introduction of the infection is one requiring constant vigilance on the part of the manager. It should be borne in mind that any cow or heifer of breeding age whose history is not definitely known may be a possible source of infection. In buying replacements for the herd, it is necessary that all cattle added be tested and shown free from abortion. If replacements come from farms on which infected cows have been kept, the replacements should be held in quarantine for at least 90 days and not fewer than two retests should be made during this period. If the replacements have originated on farms where all of the cattle have been tested and found free from Bang's disease, this period of quarantine is not necessary.

In adding replacements, care should be taken not to haul the cattle in stock trucks until the trucks have been thoroughly cleaned and disinfected. It is not advisable to purchase as replacements animals that have been kept in public stockyards and exposed to the infections usually present in such yards.

No cow or heifer from an abortion-free herd should be pastured with untested animals. If stray cattle are found in the pastures or corrals on premises free from Bang's disease, the strays should be removed immediately. If possible, the strays should be tested in order to determine whether they may have spread infection to the clean cattle with which they have come in contact.

If herds known to be infected with Bang's disease are being pastured in fields immediately adjacent to disease-free herds, it is advisable to have

a double fence between the two groups. While this will prevent the cows and heifers from becoming infected through licking the diseased animals, it will not protect them from organisms which might be brought into the pastures in drainage water.

If cattle from free herds are exhibited at fairs or shows, care should be taken not to expose them to any untested animals. Fortunately, in Oregon most of the fairs are now requiring that all exhibited animals must be tested for and be free from Bang's disease.

In order to determine whether or not disease-free herds can be maintained, a very considerable number of cooperative projects have been under way for the past twelve years. In some of these, the disease was present when the work was first started and was eradicated by following one or the other of the three methods outlined above. The other herds were free from Bang's disease at the beginning of the cooperative work. During the twelve years, it has been demonstrated definitely that it is possible, under the conditions existing on Oregon farms, to maintain herds free from Bang's disease. The percentage of herds which have become reinfected has been very small. In most instances when reinfection did occur, it was possible to trace the source of the trouble to some contact between clean cattle and one or more diseased animals. The number of herds in which the infection has been introduced by indirect methods such as birds, dogs, or running water, has been very small.

It is fully as practicable to maintain herds free from abortion as to maintain tuberculosis-free herds.

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