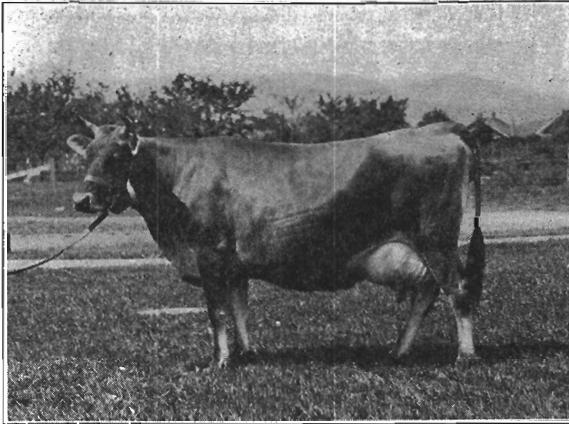


The Eradication of Infectious Abortion from the Dairy Herd of Oregon State Agricultural College



A clean daughter of a reacting cow. Oregon Maple H, 432362, tattoo No. 26, a 254-day daughter of Oregon Sweet Glow. A non-reacting cow that has had seven normal calves in 8 years. Gold Medal record of 15081 lbs. milk and 793.18 lbs. fat as a senior three-year-old.

Agricultural Experiment Station
Oregon State Agricultural College
CORVALLIS

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FOREWORD

INFECTIONOUS abortion of cattle is the most serious contagious disease affecting the livestock industry in Oregon.

This bulletin explains the methods followed in eradicating infectious abortion from the dairy herd of Oregon State Agricultural College and in protecting this herd from the reintroduction of this disease.

The information gained in this study supplemented by that acquired in field study has enabled the Oregon Agricultural Experiment Station to work out the "Oregon System" for the prevention, control, and eradication of this disease. This system is being used successfully in many of the dairy herds in the state.

The Eradication of Infectious Abortion from the Dairy Herd of Oregon State Agricultural College

This is a partial report of joint studies by the departments of Veterinary Medicine and Dairy Husbandry. Veterinary Medicine: B. T. Simms, C. R. Donham, F. W. Miller (resigned Nov. 30, 1925). Dairy Husbandry: P. M. Brandt, I. R. Jones, R. C. Jones (resigned June 30, 1925).

INTRODUCTION AND SPREAD

During the years 1913 and 1914 there were no abortions or indications of infectious abortion in the dairy herd of Oregon State Agricultural College. In January, 1915, five females, four of which were pregnant, were introduced into the herd. In April one of these animals delivered a mummified fetus. In August two others aborted.

The aborted fetuses and their membranes were buried, the stalls and stanchions in which the abortions occurred were cleaned and disinfected, the aborting cows were isolated until all indications of discharges had disappeared, and a separate bull for mating with these cows was used. In spite of these precautions, however, the disease gradually spread to other animals in the herd. It was soon realized that definite knowledge of the methods of spread of infectious abortion must be obtained if the disease was to be controlled. Consequently, experimental studies of methods of spread of the disease were immediately begun.

METHODS OF SPREAD

Five possibilities as methods of spread were studied. These were (1) by the bull at the time of service, (2) by the infected dam to the offspring through infection before birth, (3) through feeding infected milk to calves, (4) by exposing unbred heifers to aborting cows, and (5) by exposing pregnant cows and heifers to aborting cows.

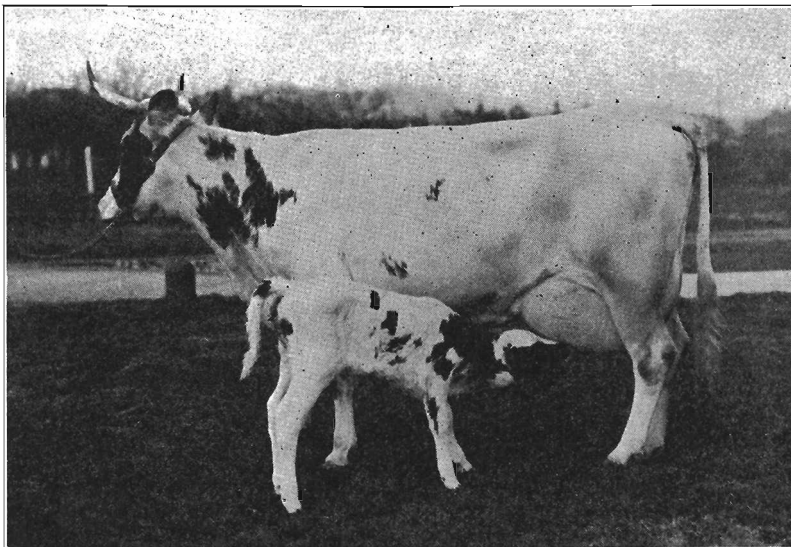
By the bull. Eight bulls were used in the first series of experiments. All of them were bred to cows which had aborted; they were later bred to abortion-free cows. In some instances bulls were mated with abortion-free cows within six or eight hours after they were mated with abortion-infected cows. In other cases several weeks passed between the mating with an aborting cow and the mating with an abortion-free cow. Results were always the same. In no instance did the bull spread the disease.

By the infected dam to her offspring before birth. Both heifer and bull calves from infected dams were studied. Some of these calves were born prematurely. In all instances these calves were free from abortion when they reached maturity provided they had not been exposed to the disease after they passed the age of six months.

By feeding infected milk to calves. It was already known that abortion-infected cows frequently excreted abortion germs in their milk. In order to determine whether it was dangerous to feed this infected milk, 96 heifer calves were used in an experiment. In all instances in which the feeding of such milk was stopped by the time the calves were

six months old, the animals were free from abortion when they reached maturity. If, however, infected milk was fed until the heifers were of breeding age, it was possible to infect them.

By exposing unbred heifers to aborting cows. In this experiment unbred heifers were penned and pastured with aborting cows. If the heifers had not begun to show heat periods they uniformly failed to contract the disease. But if they were coming in heat an occasional animal contracted the trouble.



Building up a herd from abortion-infected cattle by isolation of calves.

Oregon Panetta Q, 75207, tattoo No. 445. With one of daughters at side. Her dam aborted first calf in 237 days, the calf being dead. She was the second calf and was followed by two other normal calves which have clean offspring in the herd. Oregon Panetta Q has had six normal calves, five of which were females and are all abortion-free animals in the College herd. Oregon Panetta Q is the U. S. record holder senior three-year-old in the Ayrshire Roll of Honor with 14,370 lbs. milk and 584.7 lbs. fat in 300 days.

By exposing pregnant cows and heifers. It was found that pregnant cows and heifers could be infected very easily through exposing them to aborting cows. In the first experiment of these studies eight pregnant heifers were penned with three aborting cows. Five of these heifers contracted the disease and aborted. Other experiments proved that pregnant animals may become infected through being placed in quarters in which infected cows have aborted, thus showing that the germs may live in barns after all reacting animals are removed.

Experiments in which cattle were drenched with abortion germs resulted in the establishment of the infection. These results proved that the infection can enter the body through the mouth and showed the danger of pasturing pregnant animals in pastures where abortions have occurred.

DIAGNOSIS OF INFECTIOUS ABORTION

During the same time that the methods of spread of the disease were being worked out, extensive experiments with the blood test known as the agglutination test were being made. Other laboratories had already reported that this was a satisfactory method of diagnosis. Our experiments confirmed these conclusions. The agglutination test will not determine just what cows and heifers will abort, but it will determine which ones are harboring abortion germs and are consequently possible sources of infection.

It is not claimed that the agglutination test is 100 percent reliable, but it has proved to be a sufficiently successful method of diagnosis to permit the control and eradication of the disease.

INFECTED COWS UNPROFITABLE

Early in these studies it was observed that the reacting cows were unprofitable. Since fairly complete records were kept of every cow it was possible to show just why this was true. There were five reasons, presented below, causing these cows to be unprofitable.

1. **Infected cows gave less milk.** Both the infected and abortion-free cows were kept in the same barn and fed the same rations. They were of the same general type and breed, but the reacting cows gave less milk and butter-fat. During the three-year period, 1919-1921, inclusive, the average milk production per cow per year for the infected cows was 5045.6 pounds, while for the abortion-free group the average was 6974.7 pounds of milk per cow per year. This is a difference of 28 percent. One group of eight half sisters (sired by the same bull) passed through their pregnancies abortion-free and gave birth to normal calves. Their first calf production records were used as a basis for estimating production at maturity. Six of these became abortion-infected. Only one of these six animals ever reached her estimated maximum production. As a group, the six lacked an average of 84 pounds of butter-fat each of producing the estimated maximum, but the two which did not become abortion-infected exceeded their estimated maximums, one by 38 pounds and the other by 79 pounds of butter-fat, or an average of 53½ pounds each.

These studies showed that even though the infected cows carried their calves full time, their production of milk and butter-fat was not up to the expected normal.

2. **Reacting cows had more garget.** Records were kept of all cases of garget in the herd. Among forty-four reacting cows there were thirty-one cases of garget during three years. During the same time there were two cases of garget in twenty-seven abortion-free cows.

3. **Reacting cows had more breeding trouble.** The total number of reacting cows in the herd for the four years, 1919-1922, was 69. Thirteen of these were sold to the butcher on account of sterility. During this same time there was a total of 56 non-reactors in the herd. None of these went to the butcher as sterile. During this same period the

reacting group required 3.25 bull services for each pregnancy and the abortion-free group required 2.47 services for each pregnancy.

4. **Reacting cows had more enlarged joints and lameness.** Chronic enlarged joints with lameness were fairly numerous among the reacting group. Such troubles were very unusual among the abortion-free animals.

5. **Reacting cows produced fewer living calves.** Both difficult breeding and abortions reduced the percentage of live calves per year from the infected animals. During the four years, 1919-1922, the average number of infected cows in the herd was 36. The average number of live calves per year from this group was 22. In other words, there was one live calf per cow each 19.6 months.

During these same four years there was an average of 19.75 calves per year from an average of 23 non-reactors. This represented one live calf per cow each 13.4 months.

In this pure-bred herd such a decrease in the number of live calves represented quite an economic loss.

INFECTED COWS DID NOT DEVELOP IMMUNITY AND THE DISEASE DID NOT RUN OUT

Contrary to a somewhat general belief the infected cows did not develop an immunity. Three cows aborted three times each, two aborted four times each, and one aborted five times. Neither did the disease gradually disappear from the herd as many people predicted it would. During the four-year period, 1919-1922, inclusive, there were 46 abortions and 88 living calves from the infected animals. It became increasingly evident that the disease could be controlled only through preventing exposure of susceptible females.

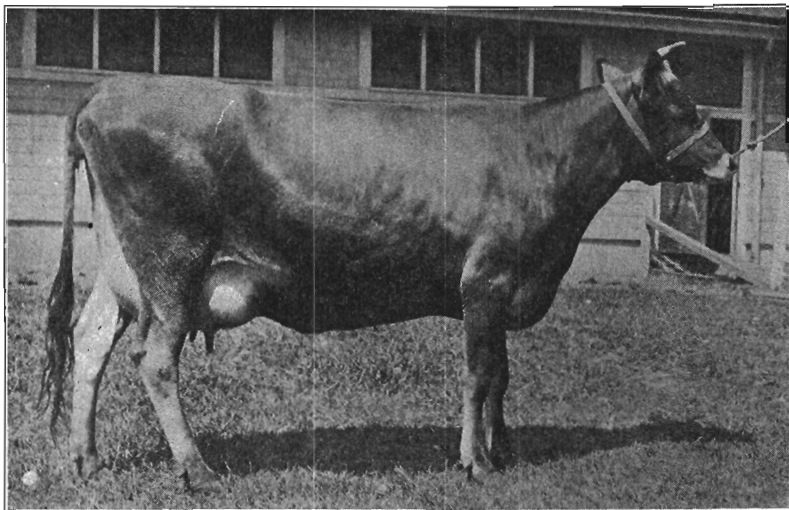
THE OREGON SYSTEM OF PREVENTING, CONTROL- LING, AND ERADICATING INFECTIOUS ABORTION

With the information that is presented in the preceding pages, it was possible to propose a definite system for the prevention, control, and eradication of infectious abortion. Such a system was dependent upon the experimental studies which had proved (1) that the infected cow or heifer was the source of the infection, (2) that the agglutination test was a reliable method of detecting these animals, (3) that the cow or pregnant heifer was the susceptible animal, (4) that the disease was not inherited, and (5) that heifer calves could be fed infected milk without establishing infection in such heifers.

This Oregon System was first outlined to the Oregon Dairymen's Association at Hillsboro in January, 1919. Attention was called at that time to the fact that abortion-free heifers had been raised from abortion-infected cows and that the raising of such heifers was the basis of the

system. It was further stated that this system was based upon controlled experiments and that extensive field studies in addition to a continuation of the more closely controlled work at Corvallis must be made before this could be recommended as a practical procedure.

During the 1919 session of the Oregon Legislature, the Oregon Dairymen's Association requested the enactment of a measure appropriating funds to be used by the Oregon Agricultural Experiment Station in the study of diseases of cattle. This measure was passed and studies of infectious abortion under field conditions were immediately



Oregon Sweet Glow, 353613, tattoo No. 16. Abortion reactor after first calf. Second calf, Oregon Malpe H, 432362, tattoo No. 26 carried 254 days. Aborted third calf. Fourth calf normal. Aborted fifth and sixth calves. Seventh calf normal. Record 9871 lbs. milk, 537.6 lbs. fat as a senior three-year-old.

started. In March, 1919, the first herd of Oregon cattle was freed of infectious abortion through the application of the Oregon System.

Due to lack of sufficient space for isolation this system was not adopted in the College herd until 1920. In the meanwhile many other experiments and observations were being made with the herd at the Agricultural Experiment Station.

ERADICATING THE DISEASE

In December, 1920, it was possible to segregate the abortion-free cows and heifers in one wing of the barn. It was realized that this was not an ideal arrangement as the same caretakers went back and forth, and, in spite of all efforts to the contrary, the infected and non-infected animals occasionally got together in the lots. Consequently, several

reacting animals were found from time to time in the free group and removed to the reacting group. By frequent testing, however, it was possible to detect these reactors before they became serious spreaders. Under this method of management the number of non-reacting females increased from 57 in December, 1920, to 68 in September, 1922.

In September, 1922, a separate barn about a mile from the main barn was leased and the infected cattle were placed in it. Separate caretakers were provided for the two groups. The main barn was cleaned and disinfected thoroughly before the abortion-free animals were placed in the part where the reactors had been kept.

The infected cows were bred to the herd sires which were used for the abortion-free animals. In such breeding operations the infected cows were never taken either into the bull pens or upon any ground to which abortion-free cows had access. Calves born from infected animals were isolated for six weeks and then placed with the calves from the abortion-free cows.

The abortion-free herd was tested monthly and any reactors found were immediately removed and placed in the abortion-infected group. During the two years, ten reactors were found.

Under this system of management the number of non-reacting females increased from 68 in September, 1922, to 101 in October, 1924. At this time the entire group of abortion reactors was sold to the department of Veterinary Medicine and the College dairy herd was finally rid of abortion-infected animals.

Testing at regular intervals was continued. Four reactors were removed from the herd between October, 1924, and March, 1926. It is believed that these animals became infected through the use of feed which had been placed on a floor on which infected animals had been kept. During the last two years no reactors have been found.

The herd now contains 108 females. It is interesting to note that 69 of these are either daughters, granddaughters, or great-granddaughters of reacting cows. In other words, if no offspring of reacting females had been kept the total number of females in the herd would now be only 39.

Since September, 1922, there have been six abortions in the herd which so far as could be determined by blood tests, bacteriological studies, or further spread of the disease, were not caused by the germ of infectious abortion. During this same period there were two hundred live calves born, or thirty-three live calves to each abortion.

PREVENTING REINTRODUCTION OF THE DISEASE

An abortion-infected herd which was not a part of the dairy herd was kept within two hundred yards of the barn in which the abortion-free animals of the dairy herd were quartered. In spite of this fact protection of the herd from reintroduction of infectious abortion has proved to be practical. In order to accomplish this the following rules have been closely followed:

1. No females from untested herds are allowed on the premises. When it is found necessary to buy females from untested herds, such

animals are tested, held in quarantine 40 days, and retested before they are added to the herd.

2. No animals of the herd are put in any pasture in which untested females are or recently have been kept.

3. No animals of the herd are ever taken to any shows or fairs where untested cattle are exhibited.

The herd is still being tested at regular intervals in order that any animals which might possibly become infected would be detected before they had become spreaders of the disease. Regular testing of an abortion-free herd seems to be even more necessary than the regular testing of a tuberculosis-free herd. This is true because the percentage of abortion-infected cattle in Oregon is much higher than the percentage of tuberculosis-infected animals. With the higher percentage of abortion-infected animals it naturally follows that the chances of infection from the outside are greater.

SUMMARY

1. Infectious abortion was introduced into the College herd through buying infected pregnant females.
2. All attempts at controlling the disease through temporary isolation of aborting cows, cleaning and disinfecting the stalls and stanchions in which abortions had occurred, burning or burying aborted fetuses and membranes, and using different bulls for mating with the abortion-infected cows failed.
3. The disease was spread by infected females.
4. The agglutination test proved to be a reliable method of diagnosis.
5. Infected cows did not always abort.
6. Infected cows were unprofitable because
 - a. They gave less milk.
 - b. They had more garget.
 - c. They had more breeding trouble.
 - d. They developed more cases of chronic inflammation of the joints and lameness.
 - e. They produced fewer live calves.
7. Infected cows did not develop an immunity and the disease did not disappear.
8. The disease was eradicated through
 - a. Separating the reactors from the non-reactors to stop the spread of the disease.
 - b. Raising abortion-free females to take the place of abortion-infected animals.
 - c. Removing reactors from the herd.
 - d. Cleaning and disinfecting the barn.
 - e. Testing frequently and removing all new reactors before they became dangerous.
9. The herd has been protected from reintroduction of infectious abortion through preventing any contact in barns, pastures, or show rings between any females in the College herd and any other females not tested for abortion, and through preventing spread of infection by contact with the clean animals by caretakers or on feed.

Note: Experimental field application of the methods outlined in this report is the basis of the plan for accrediting herds free from this disease adopted by the Oregon Live Stock Sanitary Board June 14, 1928.