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BRUCELLOSIS OF CATTLE¹

By V. K. McMAHAN

INTRODUCTION

Brucellosis (Bang's disease) of cattle is a disease of great economic importance to the farmers of Kansas and probably is responsible for greater loss to the cattle industry of the state than any other single disease. The loss was estimated at \$4,368,000 in 1937 and certainly is no less now.

Cows infected with brucellosis (1) produce fewer and weaker calves, (2) produce 26 to 30 percent less milk, (3) often become sterile, (4) have a high percentage of retained placentas and troubles of the reproductive organs, (5) are more subject to mastitis, (6) may have enlarged joints and lameness, (7) increase the owner's labor costs, (8) necessitate keeping of an increased number of females, and (9) reduce the value of all animals in the herd.

In 1887 Dr. Bruce, an Englishman, isolated the germ that caused abortion disease of goats on the island of Malta and in 1897 Professor Bang of Denmark found the cause of abortion disease of cattle. The disease of cattle was called Bang's disease until Dr. Evans of the Bureau of Animal Industry found that the germs causing abortion disease in swine, goats and cattle were very closely related. Now the disease caused by this group of germs in any animal is called brucellosis in honor of Dr. Bruce.

This circular consists of a discussion of the disease, brucellosis, in an endeavor to answer some of the questions usually asked by farmers and stockmen.

NATURE OF BRUCELLOSIS

Brucellosis of cattle is a chronic, infectious disease caused by the germ or micro-organism, *Brucella abortus*. It has been called infectious abortion, contagious abortion and Bang's disease.

Symptoms in the Cow.—As a rule, this disease does not affect the general health of the animal. Usually the first symptom is the birth of a dead calf before time, known as an abortion, or the birth of a live calf prematurely. The usual signs

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of parturition or calving may precede abortion such as swelling of the vulva and udder and a discharge from the vagina. A retained placenta or "afterbirth" following an otherwise normal calving may indicate *Brucella* infection.

Symptoms in the Bull.—In the bull brucellosis may cause inflammation and swelling of the testicles, epididymis and seminal vesicles with a resulting sterility.

Susceptibility.—Cattle are affected primarily and this germ is one cause of undulant or Malta fever in man. The *B. abortus* germ has also been found in the horse, mule, goat, hog, dog, cat, chicken, bison and elk.

Infection usually takes place after sexual maturity and most commonly during the first pregnancy. The infection seldom becomes established in calves and young heifers.

It is estimated that about one percent of the bulls are infected.

Time of Abortion.—The infected cow may abort anytime during pregnancy but does so most commonly during the fifth, sixth or seventh month. Abortions that occur early in pregnancy frequently pass unnoticed but abortion should be suspected when a cow that is believed definitely settled again comes in heat. A cow that aborts at any time should be handled as though she were infected with brucellosis until it is proved different. A large percentage of the infected cows will abort once, some will abort two times and a few will abort three or more times. There is no way to determine which cows will abort or the number of times they will abort. Some infected cows never abort their calves but they do spread the germs at calving time.

How *Brucella Abortus* Germ Causes Abortion.—This germ localizes in the uterus or womb of the mother during pregnancy. It penetrates between the uterus and the membranes surrounding the fetus or immature calf, setting up an inflammation and causing them to separate. The calf may be aborted or it may live to be born at full term depending on the amount of injury caused by the germs. Live calves from infected cows are often weak and, therefore, very susceptible to such diseases as calf scours and calf pneumonia.

MODE OF INFECTION

The principal means of infection is through the digestive tract, that is, by eating or drinking *Brucella*-contaminated feed or water. A cow may become infected through the skin or the teat canals when she lies in or walks through infective material. The third possible but probably not important method is through placement of the organism in the vagina by an infected bull during service.

SPREAD OF THE INFECTION

The Infected Cow.—The cow spreads the disease mainly at the time she aborts or calves normally. The germs are pres-

ent in the placenta or "afterbirth", in the discharge from the vagina following calving or abortion and in the aborted fetus.

Most outbreaks of brucellosis in previously non-infected herds may be traced to the purchase of infected animals which later spread the disease when they calve or abort.

The Bull.—Although bulls become infected and occasionally pass the germs of brucellosis in the semen, no one has been able to show that the disease is transmitted in this way. The greater danger seems to be from contaminating the soil with infective material at the time breeding takes place. From the contaminated soil, a cow may become infected.

It has been shown that the organisms die in less than an hour when injected into the sheath of the bull so the chances of the bull carrying the germs from one cow to another are slight.

Bulls with positive blood tests should not be used for breeding purposes but should be sold for slaughter.

The Calf.—The skin of the newly born calf from an infected cow may be teeming with *Brucella* organisms. The feces of the calf also contain the organisms and may contaminate the feed and water of the remainder of the herd. If the calf is fed milk from non-infected cows, its feces will be free of the infection in six or eight weeks.

Milk.—After an infected cow calves normally or aborts, the germs leave the uterus and localize in the udder and associated lymph nodes. After they have localized in the udder they may be secreted in the milk indefinitely and then may be a source of infection for man or animals drinking the milk.

Although calves are quite resistant to infection, older calves may become infected from drinking infected milk. Also the live germs are passed out in the feces and may contaminate the feed or water of susceptible cattle.

If properly pasteurized, milk from infected cows is entirely safe for either man or animals. (See Pasteurization, page 16.)

Horses.—The *Brucella abortus* organisms are sometimes found in abscesses such as the fistulous withers or poll evil of horses. They have also been found in the feces of horses in which case they may have been localized in the intestinal tract. Although probably not common, it is possible for horses to spread the infection.

Hogs.—Cattle may become infected with the type of germ that affects hogs, therefore, infected hogs should not be allowed to run with cattle.

Goats.—Cattle may also become infected with the type of germ that affects goats. However, this is not a problem in Kansas as the goat type of infection is not present in Kansas.

Sheep.—Sheep are highly resistant to infection with the germ causing brucellosis of cattle so they are not a factor in the spread of the disease.

Steers.—Steers are not a factor in the spread of the disease.

Man.—When man is infected with brucellosis, the organism is eliminated in the urine and feces. Therefore, if these materials are allowed to contaminate the feed or water of susceptible cows, infection may result.

Drainage Water.—The germs of this disease may be carried by drainage water. Clean herds should not be held in lots or pastures which may be contaminated by the drainage from fields occupied by infected cattle.

Adjoining Pastures.—Pastures should be separated by double fences with a 10-foot neutral lane between the two so there is no chance of direct contact between cattle in the two pastures. The disease may be spread across a single fence. It is also possible for dogs, birds and wild animals to carry the products of abortion such as aborted calves or "afterbirths" from one pasture to another and thus spread the disease.

DIAGNOSIS OF BRUCELLOSIS

The Agglutination Test.—This is the most frequently used diagnostic test for brucellosis and is based on the fact that the blood serum of infected animals contains antibodies that will, when mixed with a suspension of the bacteria responsible for the disease, cause the bacteria to clump or agglutinate. The blood serum of non-infected animals will not cause this clumping because the specific antibodies are not present.

The Tube and Plate Agglutination Tests.—These are two types of the agglutination test. The tube test has an incubation period of 40-48 hours; the plate test has an incubation period of 8-10 minutes. Both are accurate and reliable in the hands of skilled technicians.

Dilutions In the Agglutination Test.—By testing thousands of cows with the agglutination test and then checking them bacteriologically for the presence of the *B. abortus* organism, research workers have found that:

1. If one part of a cow's blood serum would clump or agglutinate 100 parts or more of a suspension of the *B. abortus* organism, the *Brucella* germs could be isolated from the cow.
2. When one part of a cow's blood serum caused clumping of less than 100 parts of the suspension of germs, the *Brucella* organisms could seldom be isolated from the cow.
3. If the cow's serum did not cause clumping in any dilution, no *Brucella* germs could be found in the cow.

Reactors.—These are animals that are actually infected. They have reacted to the blood test in a dilution of 1-100 or over and sometimes are called "positive" cows.

Suspects.—These are animals that react to the blood test in a dilution of less than 1-100. Some of this group of animals

will be reactors within a few weeks, others will be negative in a short time and the remainder will continue as "suspects".

Negative Cows.—These are cows that do not react to the blood test and are not infected. They are sometimes called "clean" cows.

Value of the Test on Milk.—The agglutination test on milk is not reliable in determining whether or not the milk contains *Brucella* organisms. A positive milk test simply indicates that the cow is infected with brucellosis. However, the milk from all infected cows does not react to the test.

FACTORS INFLUENCING THE AGGLUTINATION TEST

Normal Variations.—Normally the blood reaction fluctuates on different tests taken over a period of time. In only an occasional cow is the infection ever eliminated so that the positive blood test becomes negative.

Some non-infected cows show a slight blood reaction, sometimes as high as 1-50. This is apparently a rather non-specific reaction.

Effect of Calving or Abortion.—The act of calving or aborting has no marked effect on the blood reaction. That is, if a cow is a reactor before calving or aborting she will also react immediately afterward. However, a cow may have a negative blood reaction before calving or aborting but within a few days to three weeks afterward will be a reactor. In these cases the cow has evidently been infected recently and has not had time to develop a blood reaction or the germs were not present in the blood stream in large numbers until after calving or the abortion.

Effect of Recent Infection.—After a cow is exposed to the disease a period of time elapses before she will show a blood reaction. This is called the incubation period and usually varies from 15 days to three months or possibly longer at times.

Effect of Other Diseases on the Test.—Other diseases do not affect the test in diagnostic dilutions. The test is specific for brucellosis in livestock.

COLLECTING BLOOD SAMPLES FOR THE BLOOD TEST

Identification of Animals.—All cattle to be tested for brucellosis must be properly identified before the blood samples are collected. Suitably identified animals may carry either non-removable ear tags or legible tattoos.

Drawing and Care of Samples.—Samples should be drawn in clean, dry tubes or vials that are not over five-eighths of an inch of diameter as larger tubes are not easily handled in most laboratories. Old medicine, vaccine or cosmetic bottles should not be used.

The blood should be drawn from the jugular vein by a qualified veterinarian. Each blood sample must be marked

and an accurate record made to correspond to each sample. This record should include the identification number, age, sex, breed and description of the animal bled. The veterinarian may test the samples or send them to an approved laboratory for testing.

Blood samples should be kept warm until the clots start to retract from the sides of the tubes, after which they may be placed in refrigeration to prevent decomposition. Blood samples that have frozen, become overheated or have decomposed cannot be tested accurately. Do not add preservatives. If the blood is likely to decompose before reaching the laboratory, the clear serum may be removed from the clot and sent to the laboratory separately.

STATE REGULATIONS GOVERNING DISPOSITION OF REACTORS AND SUSPECTS

Most outbreaks of brucellosis are the result of adding infected cows to clean herds. By preventing the promiscuous sale of infected cattle, much of the spread of brucellosis would be prevented. The present brucellosis control program in Kansas, therefore, is designed to stop the traffic in diseased cattle and the consequent spread of infection.

Identification and Quarantine of Reactors and "Suspects".—All cattle, either reactors or "suspects" by the blood test, are to be identified with an approved Kansas Bang's disease reactor tag placed in the left ear by the veterinarian making the test.

The reacting animals must be kept under quarantine and cannot be moved from the premises without written permission of the State Livestock Sanitary Commissioner and then only for immediate slaughter.

Animals classed as suspicious must be quarantined on the premises until later tests show them to be free of the disease or until removal for gale for immediate slaughter is authorized by the State Livestock Sanitary Commissioner.

Purebred Reactor Cattle.—Provision is made so that, with written permission of the State Livestock Sanitary Commissioner, infected purebred cattle may be sold as such, as additions to other herds, provided brucellosis is already present in such herds. Such animals will remain under official quarantine until their removal for slaughter is authorized by the State Livestock Sanitary Commissioner.

Vaccinated Animals.—Animals under two years of age, that have been properly vaccinated as 4- to 8-month-old calves and still show a blood reaction will not be classed as reactors provided vaccination records issued by an accredited veterinarian or a veterinarian of the Bureau of Animal Industry can be furnished.

DISINFECTATION OF CONTAMINATED PREMISES

Resistance of the *Brucella Abortus* Germ.—This germ is killed in a few minutes by direct sunlight and lives only a few days in urine or dry manure. However, in moist dung or in an aborted fetus during cool weather it may live 75 days or more. It is believed to live only a short time in pastures unless covered with manure or bedding.

Disinfectants That May Be Used.—Chlorinated lime may be used either as the dry powder or in liquid form at the rate of one pound in 15 gallons of water. It is not effective in the presence of dirt and manure. Because it gradually loses its chlorine content, chlorinated lime should not be used after it has been stored for a few months.

Quicklime may be used in the form of dry powder on wet surfaces or in liquid form as the freshly water-slaked lime which is made by adding one pint of water to two pounds of quicklime. When exposed to the air, quicklime undergoes a chemical change which makes it practically useless as a germicide. Therefore, quicklime that has been stored for some time should not be used as a disinfectant. The production of heat and the crumbling of the hard lumps in the quicklime after the addition of water, indicate lime of good quality. This is a good product to use in the presence of manure and animal discharges.

A 3-percent solution of cresylic acid is very effective and may be used any place where the odor is not objectionable. The cresylic acid solution must be made up in soft water. When hard water is used, changes take place that allow the cresylic acid to collect at the surface, leaving the rest of the solution without germicidal value.

A cheap and very effective disinfectant is a solution of household lye made by adding one pound of lye to seven gallons of water. Because no disinfectant can kill germs unless it can come in contact with them, it is recommended to scrub the surfaces to be disinfected with a hot lye solution before applying one of the other disinfectants.

Contaminated Soil.—Areas of ground on which an abortion has taken place or on which an infected cow has calved may be covered liberally with chlorinated lime or quicklime (one or two inches). Solutions of the cresol compounds are quite effective on the surface of the soil. The products of abortion should be burned completely or buried deeply with quicklime.

Cleaning Lots and Pastures.—Remove all bedding and manure from the lots and as much from the pastures as possible. Where pastures are not too rough, an ordinary spike-tooth harrow may be run over the pasture to break up or turn manure piles so the bacteria will be exposed to the sunlight. Remove three inches of top soil from around feed bunks and

water tanks and if possible, from the entire lot. If the top soil cannot be removed, then the lot should be plowed deeply. This either removes the germs or exposes them to the destructive action of sunlight. The infective material removed during the cleaning process should be spread on fields that will not be grazed by cattle for some time.

Scrub all feed troughs and water tanks with a hot lye water solution and apply one of the above mentioned disinfectants.

Trucks and Stock Cars.—Clean out all dirt, manure and bedding and flush with water. Then scrub with a hot 2-percent lye solution and follow with a good disinfectant such as a 3-percent cresylic acid solution.

Barn and Maternity Stalls.—Clean out all dirt, manure and bedding, paying particular attention to the mangers and water cups. Scrub everything with the hot lye solution and follow with a disinfectant. Because the odor of cresol is absorbed by milk it may be better to use a chlorine disinfectant around the milk-barn.

When to Restock.—If a thorough cleaning and disinfection has been accomplished it is reasonably safe to bring in healthy cattle at once. Of course when it is possible, an idle period of two or three months in summer and five or six months in winter will leave a greater margin of safety.

OTHER CAUSES OF ABORTION

Brucella infection is responsible for about 85 percent of the abortions in cattle and the first abortion in a herd is much more likely to be due to this infection than to some other cause. The other 15 percent of the abortions may be caused by any one of several factors.

Accidents.—Undoubtedly accidents may cause abortion but not nearly so frequently as is claimed. There is a tendency to blame abortions on accidents if no other cause is known. Accidents injure the cow and may open an avenue for invasion of the fetus and membranes by bacteria. Accidents probably are not responsible for many abortions.

Other Diseases.—Any acute disease may cause abortion. This includes such diseases as acute anaplasmosis, tuberculosis and pneumonia. Such germs as a streptococcus, the colon bacillus, the paratyphoid organism, the pus organism (*Corynebacterium pyogenes*) and the *Vibrio fetus* organism may cause abortion.

Trichomoniasis.—This is a protozoan disease which is relatively new in this country. It is spread by the bull during service and abortion usually occurs between the first and fourth months of pregnancy. Pus or pus-like discharges from the vagina are characteristic of this disease, along with frequent heat periods and sterility.

Some outbreaks of abortion in herds negative to the blood test have been found to be due to trichomonad infection.

Ergot Poisoning.—Ergot is a fungus which affects wild and tame rye, occasionally other small grains and some of the wild grasses. The fungus is a black mass which replaces the kernels in the head. When taken in sufficient amounts this material may cause abortion and when taken in larger amounts will cause a dry gangrene of the tips of the ears, the tip of the tail and of the feet.

Mold.—Certain types of molds have been identified as causing some abortions. Apparently they must be taken in large dosage to cause trouble. (*Mucor* and *Aspergillus*).

Nutrition.—Restricted rations or diets deficient in certain elements such as calcium and phosphorus as well as the lack of vitamins may cause abortions to occur.

BRUCELLOSIS OF SWINE

Cause and Symptoms.—Brucellosis of swine is caused by the germ, *Brucella suis*. It is present in Kansas and at times causes large losses. Abortion or the birth of dead pigs is the principal symptom along with sterility, stiffness and inflammation of the joints. Boars carrying the infection often have an inflammation of the testicles.

Susceptibility.—Swine are easily infected with the *B. suis* organism but are apparently not infected with the type of germ that affects cattle, *B. abortus*.

The swine type of organism is very infectious for man so care must be taken in handling infected swine.

Diagnosis.—The disease in swine is commonly diagnosed by the agglutination test as it is in cattle. A reaction of 1-25 or 1-50 is considered evidence of infection in swine.

Methods of Control.—Brucellosis of swine is a somewhat self-limiting disease. Often an infected sow will lose her blood reaction within six months after being isolated.

If only a few infected animals are present, the test and slaughter method can be used to eradicate the disease. If several animals are infected then the two-herd system might be best. Either system works the same as is described in the section on control of the disease in cattle. Under the latter plan the hogs in the infected herd may be returned to the clean herd when they have lost their blood reaction.

The infected boars should be sold for slaughter as they do not recover.

Spread of the Disease.—Brucellosis is spread by the sow through the products of abortion, and also the urine and the milk. The infected boar spreads the disease through the semen during service.

If cattle are infected with the germ, *B. suis*, as sometimes

occurs, they may spread the disease to susceptible hogs. Since there is no simple way to determine which type of germ is present, susceptible swine should not be allowed to contact cattle with brucellosis.

All breeding stock should pass a clean blood test and all additions to the herd should be tested before bringing them on the premises.

Vaccination.—The vaccine used to immunize 4- to 8-month-old calves against brucellosis does not seem to be satisfactory for the vaccination of swine. As yet no vaccine has been developed that will protect swine against brucellosis.

MAINTAINING A HERD FREE OF BRUCELLOSIS BY SANITATION AND HERD MANAGEMENT

Frequency of Blood Testing.—All cattle in a clean herd should be tested at least once each year by the agglutination test to pick out any newly infected animals so they can be removed before they spread the infection.

Additions to the Herd.—Replacement animals should be limited to home-grown heifers if possible. If these are not available, then open heifers, negative to the blood test should be obtained from herds known to be free of the infection.

If mature cows must be purchased they should pass a negative blood test when purchased and then after having been kept in isolation for 60 to 90 days pass another negative blood test before entering the herd.

If pregnant cows are added to the herd they should be isolated until 60 days after calving. If calving is normal, and they pass a clean blood test at the end of 60 days, they may be considered safe to add to the herd.

Nurse Cows.—Do not bring in nurse cows if it possibly can be avoided, and then only from brucellosis-free herds.

Steers and Open Heifers.—Steers from an infected herd are not a source of infection but occasionally open, mature heifers are infected.

Handling the Cow at Calving Time.—Maternity stalls should be provided for all the cows at calving time. These stalls should be out of contact with other cattle and should be constructed so that they can be cleaned and disinfected easily. The cows should not be returned to the herd until all abnormal discharges have ceased which is usually two to three weeks after calving. After removing each cow, the stall should be cleaned and disinfected as described on page 8.

Handling the Aborting Cow.—If a cow aborts from any cause she should be handled as if it were an infectious abortion. The fetus and products of abortion should be removed and burned or buried deeply and the area covered with quicklime or other good disinfectant.

The cow should be isolated at once and a blood test made for brucellosis. If the cow is infected she should be sold for slaughter, if not she should be kept in isolation for 60 days. If a blood test at this time does not show infection the cow may be returned to the herd.

Range Cattle.—Although it is impractical to have range cattle calve in maternity stalls, there are two things that can be done to help keep the herd free of brucellosis. The first is to be sure no infected cattle are present in the pasture used by the clean herd. Avoid pasturing the clean herd with any cattle from other herds. The second is to run blood tests for brucellosis on the entire herd each spring before the cattle go to pasture or, better still, blood-test in both the fall and spring. In this way if any reactor is present it can be removed to prevent the spread of the disease.

COMPLICATIONS ACCOMPANYING BRUCELLA INFECTION

Breeding Hygiene.—After a cow aborts she should be isolated until all discharges cease and handled as if she had brucellosis. If blood tests show *Brucella* infection to be absent and discharges soon cease, the cow may be bred in 60 days following the abortion. In case infection of the uterus develops or the placenta is retained following calving or abortion, the cow should be rested for 120 days before breeding.

Treatment of Retained Placenta and Chronic Vaginal Discharge.—These conditions are abnormal and frequently follow abortion. Often they are the only symptoms of *Brucella* infection. The period following abortion is of utmost importance in the cow's breeding life and poor care or treatment by an inexperienced herdsman may so damage the animal as to render her incapable of again carrying a normal healthy calf. An experienced veterinarian can be of inestimable service at this time.

Sterility.—A large percentage of the cows infected with brucellosis become either shy breeders or hopelessly sterile.

The *Brucella* infection lowers the resistance of the animal so that other germs can enter the cow's body and reproduce. These secondary invaders injure the reproductive organs so that normal conception and calving do not occur.

Inflammation of the Udder (Mastitis).—The *Brucella* germs may sometimes be the primary cause of mastitis but usually they cause only mild injury to the udder. This weakens the udder so it is easily invaded by other germs that do cause a severe mastitis.

CONTROL OF BRUCELLOSIS

In the control of this disease each herd is an individual problem. The method to use will depend on the number of

infected animals in the herd, the value of the animals, and the facilities available on the farm. As the veterinarian is dealing with this problem every day his advice should be obtained.

The first step in any method of control should be a blood test of all animals in the herd over 6 months of age to find how many infected animals are present.

Medicines and Drugs.—Although many remedies have been tried in the past and a lot of money has been spent for them, none is of value. There is no way to cure an animal of brucellosis once she is infected.

Test and Slaughter Method.—The test and slaughter method is most practical in eliminating the disease from dairy herds and from herds where the number of reactors is small.

The entire herd is blood tested and all reactors are sold for slaughter. The barns and corrals are cleaned thoroughly after removing the infected cows. The herd is retested every four to eight weeks to pick up any newly infected animals. After the herd passes three consecutive clean tests, two or three semi-annual tests are made and if the herd is still free of infection, only annual tests are necessary.

One should remember that the animals in a herd free of infection are susceptible and care must be taken not to expose them to brucellosis-infected cows.

A plan of calfhood vaccination as described later may be used so that replacement animals will have at least some immunity.

Federal-State Plan of Brucellosis Eradication.—The State Livestock Sanitary Commission of Kansas and the Bureau of Animal Industry have cooperated in eradicating the disease from many Kansas farms. On July 31, 1948, there were 6,863 herds containing 170,903 head of cattle operating under this plan. Of this number, 502 herds containing 12,687 head were accredited as being brucellosis free.

Under this plan the owner agrees to allow as many tests as are deemed necessary by the cooperating agencies to clean up the infection. He is to sell all cows that react to the blood test within 15 days after each test and follow a prescribed plan of sanitation. To become accredited the herd must pass three consecutive negative blood tests, the third not more than 12 months after the second. These tests are all made at no expense to the owner but, after the herd is accredited, the owner must have the herd tested annually at his own expense.

Further information may be obtained by writing the State Livestock Sanitary Commissioner at Topeka, Kansas.

The Two-Herd System.—This method may be used where there are so many reactors that it is not economically prac-

tical to sell them. It is adaptable only to those farms having facilities for keeping two completely separate herds.

The entire herd is tested and then divided into two separate units, the infected cows in one and the non-infected in the other. Separate equipment is used for tending the infected herd. Boots of the caretakers are cleaned with a 3-percent cresylic acid solution or other suitable disinfectant before going from the infected to the clean herd. The clean herd is tested about every three months to weed out any new reactors that may be present. Calves from the infected herd should be weaned as soon as possible or fed milk from the non-infected cows. These calves should be kept in a separate lot for a period of two or three months after which time they may be placed with the clean herd if they pass a negative blood test.

As the replacements are added to the clean herd the members of the infected herd are sold when they become unprofitable, ultimately leaving only the clean herd.

Calfhood vaccination may be practiced along with this system.

CALFHOOD VACCINATION

Anyone interested in calfhood vaccination for brucellosis should remember that it is not a "cure all" for that disease. It is known that cows, vaccinated as calves, may not be protected when exposed to massive infection such as is present when cows are permitted to abort in the herd and no sanitary precautions are taken. To be successful, a recommended plan of vaccination must be followed diligently and must be combined with blood testing and elimination of reactors, proper sanitation and good herd management.

The Vaccine.—The vaccine is a living culture of the *B. abortus* organism (strain No. 19) that has lost its disease producing ability.

Length of Immunity.—Cows properly vaccinated as calves seem to have same immunity through the fifth pregnancy although it probably gradually lessens as the cows grow older.

Efficiency of the Vaccine.—Of 17,608 calvings among animals vaccinated by the Bureau of Animal Industry, only 195 abortions or 1.1 percent, could be attributed to brucellosis according to the blood test.

The Vaccination Reaction.—Vaccination with the live vaccine causes the animal to have a positive blood reaction that cannot be distinguished from the blood reaction of a cow actually having the disease. For this reason, if the vaccine is not properly used, it interferes with the detection and removal of the infected cows.

Calves vaccinated between four and eight months of age should lose their blood reaction in four to 18 months. Most

of the reactions will disappear within eight months. Between 1 and 4 percent continue to react as mature cows and so must be handled as if infected. When older calves are vaccinated a much larger percent will react when mature.

Cows with a vaccination reaction do not shed the Brucella germs in the milk as a result of the vaccination and calves with a vaccination reaction do not spread the germs of abortion as a result of the vaccination.

Recommended Plan for Calftlood Vaccination.—A recommended plan of calftlood vaccination is as follows:

1. Secure the services of a good veterinarian.
2. Identify all calves to be vaccinated with some device such as ear tags, tattoos or horn brands.
3. Have all calves tested by the blood test prior to vaccination and vaccinate only those that are not infected. This test is not essential as the number of infected 4- to 8-month-old calves is small but should be made if the animals are valuable or if they may be sold. States recognizing calftlood vaccination will not allow calves carrying a vaccination reaction to enter unless complete records showing negative pre-vaccination blood tests are available.
4. Have only the 4- to 8-month-old calves vaccinated with a fresh, viable vaccine.
5. Have all calves tested 30 days after vaccination. A positive reaction indicates that the vaccine has "taken".
6. Have all calves that did not show a reaction revaccinated and tested again in 30 days to see whether or not this revaccination has "taken".
7. Have all the vaccinated animals tested when they reach breeding age and breed only those that are negative to the blood test.

Vaccination of Mature Cows.—A mature cow should not be vaccinated because the amount of immunity she will develop is uncertain and because it will cause her to be a reactor indefinitely and probably for life. As this reaction cannot be distinguished from actual infection, a clean herd cannot be formed. The infected animals from a herd can be sold only for slaughter under permit from the State Livestock Sanitary Commissioner.

REGULATIONS GOVERNING MOVEMENT OF CATTLE

Community Sales.—Since September 1, 1942 female cattle over six months of age suitable for dairy purposes (other than those provided for in the following paragraph) may not be sold at any community sale, unless identified with proper ear tag and accompanied by an official health certificate issued by an accredited veterinarian, in line with the regulations issued by the State Livestock Sanitary Commissioner, showing that such cattle have been classed as nega-

tive under Bang's disease agglutination blood test administered not more than 30 days prior to being offered for sale.

Female dairy cattle under two and one-half years of age that have been vaccinated with strain 19 B. abortus vaccine, and which still carry a positive blood titer, may be sold through community sales, if they are accompanied by test and vaccination records issued by an accredited veterinarian. Vaccination records must show that the animals were vaccinated when not less than four months and not more than eight months of age. They must also show the official vaccination tag number with which the animals were identified.²

Interstate Shipment.—All female dairy and breeding cattle over six months of age must pass a clean blood test within 30 days of the date of entering Kansas or must be from an accredited brucellosis-free herd.

The blood samples must be taken by an accredited veterinarian and they must be tested in a federal, state or an approved commercial laboratory.

Specific information regarding the sanitary regulations of other states may be obtained from your veterinarian or by writing the State Livestock Sanitary Commissioner at Topeka, Kansas.

BRUCELLOSIS AND PUBLIC HEALTH

Brucellosis of Man (Undulant Fever, Malts Fever).—Brucellosis of man may be caused by any of the three species of Brucella organisms. The disease produced is called undulant fever and is characterized by intermittent fevers, chills, headaches, aching joints, muscular pains, etc.

Although the mortality is low from this disease, the effects of it may last for months or years.

Prevention of Brucellosis in Man.—Persons handling infected hogs and cattle should be especially careful. The greatest chance for infection comes when assisting at a difficult birth, when removing retained "afterbirths" or when butchering or handling the meat products of infected swine.

When working with infected cattle and swine at calving or farrowing time, the hands and arms should be covered with a good soap before exposure and should be washed in soap and water immediately afterward. Rubber gloves and a rubber sleeve should be worn if they are available.

Thorough cooking of pork will make it safe for consumption.

Raw milk from infected cows also may be a source of infection for man. The Brucella germ is not always present in the milk of infected cows but there is no simple method of determining whether or not it is present.

² State Community Sales Law, 1942

Milk that is known to come from infected cows should not be consumed except in foods that will be cooked, unless it is first pasteurized.

Pasteurization.—This is the process of heating the milk to 143° F. for 30 minutes or to a higher temperature for a shorter period of time. Under conditions where pasteurized milk is not available, the raw milk from infected cows can be made safe for consumption by the following procedure: Heat the milk quickly to 155° F. stirring constantly, then cool rapidly by placing the vessel in cold water and continue stirring. When cool put the milk in sterilized containers and keep it in a cool place, preferably a refrigerator.

Sale of Milk from Infected Cows.—Kansas has no specific laws against selling milk from infected cows but in cities operating under the Standard Milk Ordinance, which is sponsored by the Kansas State Board of Health, Grade A raw milk must be from cows free of brucellosis.

ADDITIONAL PUBLICATIONS

Other publications of the Kansas Agricultural Experiment Station on livestock and poultry production and related subjects available for distribution at the present time include:

Cir. No.

- 83. Preparation and Shipment of Specimens for Diagnosis.
- 116. Loco Weed and Its Effect on Livestock.
- 126. Rabies—Dog Madness.
- 168. Progeny Test in Poultry Breeding.
- 178. Poultry Management.
- 198. Control of Mammals Injurious to Agriculture.
- 200. Turkey Management.
- 212. Control of Sheep Diseases.
- 220. Diseases of Feeder Cattle in Kansas.

Bul. No.

- 287. Feeding Range Lambs.
- 307. Distinguishing Sex of Chicks at Hatching.
- 314. Swine Production in Kansas.
- 316. Sheep Production in Kansas.

Tech. Bul.

- 26. Principal Poisonous Plants in Kansas.

Copies of any of these publications as well as a list of all publications available through the station may be secured as long as the supply lasts by addressing a request to the:

KANSAS AGRICULTURAL EXPERIMENT STATION,
 MANHATTAN, KANSAS