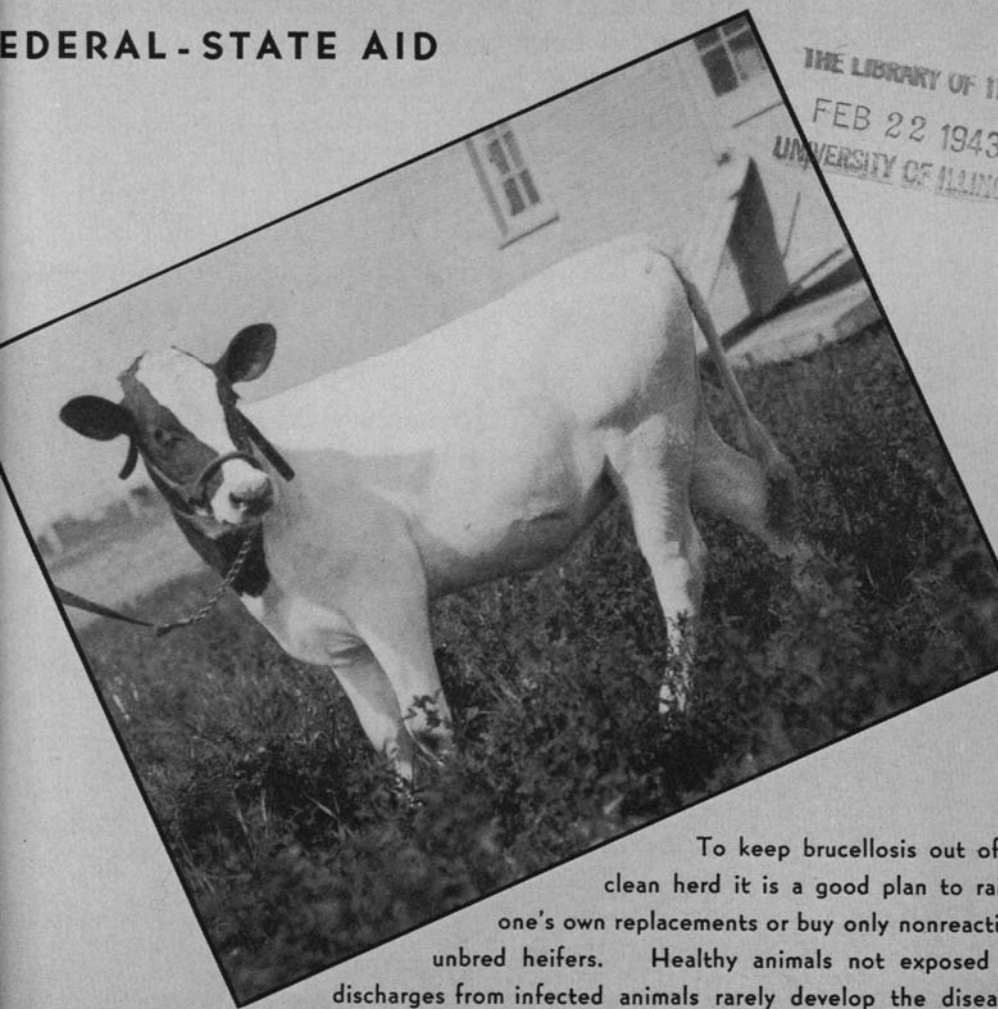


BRUCELLOSIS OF CATTLE

WHAT IT IS - HOW IT CAN BE CONTROLLED
FEDERAL-STATE AID



To keep brucellosis out of a clean herd it is a good plan to raise one's own replacements or buy only nonreactive unbred heifers. Healthy animals not exposed to discharges from infected animals rarely develop the disease.

Circular 544

UNIVERSITY OF ILLINOIS COLLEGE OF AGRICULTURE
EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS

BRUCELLOSIS OF CATTLE—formerly known as Bang's disease, infectious or contagious abortion—is widely distributed in the state, resulting in an annual loss to Illinois cattle owners of approximately 4 million dollars. Besides this loss, the *Brucella* germ found in infected cattle and milk causes a serious disease in man, known as undulant fever.

Altho contagious abortion is still a menace in Illinois, progress is being made in suppressing it, as shown by the smaller proportion of animals that give a positive reaction to the blood test. Such tests have been made by veterinarians under the direction of the Department of Animal Pathology and Hygiene of the University of Illinois. As part of the program of control this circular is issued to give information on the nature of the costly disease and measures to check it.

The most common way for brucellosis to be introduced into a healthy herd is thru the purchase of apparently healthy but infected animals. Therefore it is best for an owner to raise his own replacements. Herds free from this disease have invariably been built up from small units.

CONTENTS

	Page		Page
Nature of Brucellosis of Cattle.....	4	Calfhood Vaccination.....	13
Methods of Spread.....	5	Danger to Other Animals and Public Health.....	14
Brucellosis Reduces Profits.....	7	Federal-State Program of Control.....	15
Other Causes of Abortion.....	8	Bang and Calfhood Vaccination Control Agreement.....	16
Diagnosis of Brucellosis.....	8		
Prevention and Control Thru Herd Management.....	10		

This circular is a revision of Circular 360, "Answers to Questions Regarding Bang's Disease."

Brucellosis of Cattle

By ROBERT GRAHAM and JESSE SAMPSON¹

DURING THE PAST fifteen years brucellosis of cattle, known also as Bang's disease and infectious or contagious abortion, has been successfully controlled in over 1,500 herds in 94 Illinois counties by the cooperative efforts of herd owners, local veterinarians, and the Extension Service of the College of Agriculture. Owners voluntarily enrolled their herds in Project 1046 of the Extension Service.² These herds were tested and the infected animals either placed in temporary isolation, sold for slaughter, or sold to owners whose herds were known to be infected with brucellosis.

A careful appraisal of the work done shows that brucellosis in cattle can be suppressed by approved methods of herd management, including testing, quarantine, and disinfection of premises. Different plans can be equally successful. Each herd is a separate problem and the owner must decide which plan is best suited to his herd.

Experience has shown that a program of control that cleans up entire areas or counties at one time has distinct advantages in the suppression of brucellosis. For this reason the State Department of Agriculture, in cooperation with the Federal Bureau of Animal Industry, local veterinarians, and herd owners, is making state-wide effort to control brucellosis. It now offers area testing and three optional plans for the control of brucellosis. Briefly these plans are: (1) herd testing and slaughter of reacting animals, (2) herd testing

¹ROBERT GRAHAM, Professor of Animal Pathology and Hygiene, and JESSE SAMPSON, Associate Professor of Animal Pathology and Hygiene.

²The part of Project 1046 that provides for brucellosis control in cattle has been replaced by the three Federal-State plans. The part of Project 1046 for control in swine is still open to herd owners. It is conducted by the Extension Service of the College of Agriculture in cooperation with the State Department of Agriculture and local veterinarians. For information on the project write the DEPARTMENT OF ANIMAL PATHOLOGY AND HYGIENE, COLLEGE OF AGRICULTURE, UNIVERSITY OF ILLINOIS, URBANA.

ORIGIN OF THE NAMES OF THE DISEASE. The terms "brucellosis" and "Bang's disease" have been taken from the names of two investigators, Professor Bang of Denmark and Doctor Bruce of England. In 1896 Professor Bang first discovered the germ that causes cattle to abort, and the name "Bang's disease" was adopted. His findings were confirmed at the Illinois Agricultural Experiment Station in 1910. About sixty years ago Dr. Bruce of England discovered that the germ causing abortion in goats was also the cause of Malta fever in man. When Doctor Evans of the Federal Bureau of Animal Industry showed that this germ was closely related to the Bang germ of cattle and swine, the disease caused by the Bang germ became known as "brucellosis."

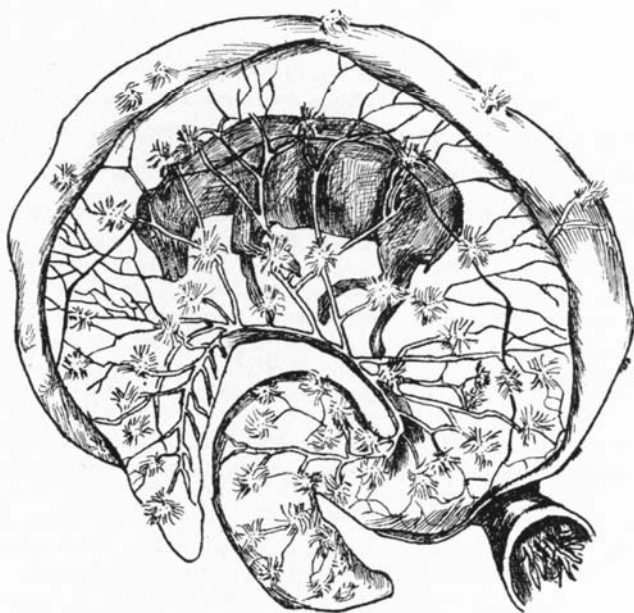
with slaughter of reacting animals and calfhood vaccination, and (3) herd testing with *deferred* slaughter of reacting animals and calfhood vaccination.

Detailed information concerning each of the above plans can be secured from the CHIEF VETERINARIAN, STATE DEPARTMENT OF AGRICULTURE, or from the Inspector in Charge, U. S. Bureau of Animal Industry, Springfield, Illinois. Copies of these plans may be found on page 16. After an initial test by an authorized veterinarian, the owner decides which plan is best adapted to his herd.

NATURE OF BRUCELLOSIS OF CATTLE

What is meant by abortion? Abortion is the expulsion of a dead or an immature fetus. It may be due to a number of causes. These causes include bacterial and protozoan infections, molds, injury, violence, illness accompanied by high fever, inadequate rations, and probably poisonous or toxic weeds.

What is brucellosis of cattle? Bovine or cattle brucellosis (Bang's disease, infectious or contagious abortion) is a specific disease



The fetal calf in the uterus is surrounded by several membranes thru which it receives nourishment. Inflammation of the placenta, the tissues uniting it with its dam, may bring about premature birth.

of cattle characterized by inflammation of the tissues (placenta) uniting the cow and calf within the womb. The inflammation interferes with the nourishment of the fetus and may cause its premature expulsion. Such premature calves may be alive or dead (stillborn). It is possible for cows to have brucellosis and to calve normally in spite of it. Whether brucellosis results in abortion depends upon the virulence of the germ and the resistance of the cow. A blood test will detect normal breeders which are infected.

Are all herds of cattle infected? No, there are many herds free from brucellosis in Illinois.

Where is *Brucella abortus* found? The germ is found in the pregnant uterus and often in the udders and milk of infected cows. Occasionally the reproductive organs of bulls also harbor the germ.

How long does the germ live outside the body? In pastures and lots directly exposed to the sunlight the germ probably survives but a few days. If it is protected from sunlight, it may live outside the body for three to six months or even longer.

Does the cattle type affect other animals or man? The cattle type of germ is occasionally found in sheep and horses. Swine are quite resistant to the cattle type. Goats in Illinois, so far as is known, are free from any kind of infectious abortion. There is, however, a distinct type of the germ that causes abortion in goats. Man is susceptible to this, as well as to the cattle and swine types. Physicians refer to the three types of brucellosis in man as undulant fever.

Are the goat and swine strains transmitted to cattle? A few cases have been reported of cattle becoming infected with the organism causing abortion in goats, *Brucella melitensis*, which also causes Malta or undulant fever in man, and with *Brucella suis*, the swine brucellosis germ. The ability of the *Brucella* germs of swine and goats to cause abortion in cattle has been demonstrated experimentally.

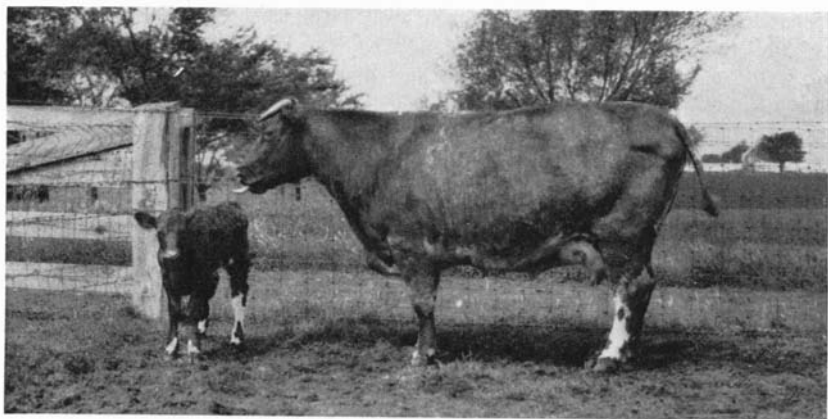
How can the disease be eradicated? Brucellosis of cattle can be eradicated by using sanitary measures, applying the agglutination test, and isolating or disposing of reactors. In infected herds calfhooed vaccination may also be practiced.

Is there a cure for brucellosis of cattle? No medicine or mineral mixture has been found that will prevent or cure brucellosis.

METHODS OF SPREAD

How is brucellosis introduced into a herd? The purchase of infected heifers, cows, or bulls is usually responsible for introducing the disease into a herd.

How does brucellosis spread within a herd? The most dangerous



This reacting beef cow had four normal calves and then dropped two successive calves a month before they were due. At the time of each calving the cow was capable of spreading the disease. Beef cattle, as well as dairy cattle, suffer from brucellosis.

period of spread is at the time infected cows abort or calve normally. Pastures, yards, and stables then become contaminated from uterine discharges, which contain more *Brucella* germs than infected milk and therefore are more potent in spreading the disease. Susceptible animals become infected thru contaminated feed and water.

Bulls also may spread brucellosis by serving discharging infected cows or as the result of a genital *Brucella* infection, which may be characterized by enlarged testes and cords. A nonreacting bull that breeds an infected discharging cow is likely to transmit the infection on the reproductive organs at the time of serving a clean animal. For further information about the bull as a carrier of infection see page 11.

What is a "spreader" or "carrier"? A "spreader" or "carrier" is an infected cow or bull that scatters brucellosis infection. The agglutination test will detect carriers.

Is drainage water a factor in the spread of this disease? Yes, drainage from contaminated pastures should be considered a dangerous source of infection.

Does the disease spread thru milk and infect calves? Infected cows may give off *Brucella* germs in the milk. Young calves, tho highly resistant to the disease, may, while drinking milk from infected cows, give a positive reaction to the agglutination test and incidentally pass *Brucella* germs in the feces. The feces will become a source of infection to animals of breeding age unless the calves are isolated. Reacting calves become negative when fed pasteurized milk or milk from nonreacting cows.

What is the cause of a sudden outbreak of brucellosis? Abortion storms occur in herds harboring spreaders, or as a result of the introduction of a virulent form of the disease, usually by the purchase of infected animals. Exposure of susceptible pregnant animals is often followed by a series of abortions.

Why should herds be tested for brucellosis? A negative blood test is the only practical way to be sure that a herd is free from brucellosis, since infected animals may breed normally but still be capable of spreading the infection. Ridding the herd of these infected animals that breed normally often prevents subsequent abortion losses, especially in pregnant heifers.

BRUCELLOSIS REDUCES PROFITS

Any disease that results in dead or weak calves and lowered milk production, as brucellosis does, is bound to cut down profits. In addition, infected cows may become sterile or possibly be made more susceptible to mastitis (garget).¹ Losses from brucellosis approximate \$4,000,000 annually in Illinois alone.

Milk flow reduced. The loss represented by an aborted calf is quite evident, but the loss due to lowered milk production may be overlooked. The production records of one cow will serve to illustrate the effect of abortion on milk flow. In two ten-month lactations following normal calving, this cow produced 6,235 and 5,220 pounds of milk respectively. After two abortions, with similar feeding, 4,220 and 2,805 pounds of milk were produced during the ten-month periods. At \$2.55 per hundred pounds, the average loss from the decrease that occurred in the milk flow after each abortion amounted to \$56.48. In one herd there was an average yearly loss of \$54 per cow over a period of four years because of lowered milk flow due to *Brucella* infection.

Sterility often follows brucellosis. Besides the decrease in milk flow and the loss of the calf, there is always the possibility that a cow infected with brucellosis will become sterile. In one group of 16 reacting cows, 6 animals, or about 40 percent, became sterile during the four years following the test. Seven cows calved normally and 3 aborted during each of the four years following the test. This means that only about 19 percent of the cows infected with brucellosis actually aborted. Thus sterility was much more costly than abortion. In another herd of reacting cattle 29, or 45 percent, became sterile over a period of five years, while a smaller percentage actually aborted.

While there are other causes of sterility—for example, certain other infections as well as nutritional deficiencies—it is clear that

¹A copy of "A Herd Program of Mastitis Prevention and Control" (mimeo.) is available upon request from the Department of Animal Pathology and Hygiene, College of Agriculture, University of Illinois.

brucellosis is one of the chief causes. Retained afterbirth occurs frequently in herds infected with brucellosis and is probably one of the most common reasons for breeding difficulties.

OTHER CAUSES OF ABORTION

Bovine trichomoniasis most important. While most abortions in cattle can be traced to *Brucella abortus*, there are other causes which need to be considered. Some abortions are caused by injury.

Probably the most important single cause of abortion and sterility in cattle, aside from *Brucella abortus*, is *Trichomonas foetus*. This microscopic one-celled protozoan is spread from one cow to another by the bull at the time of service. Infected cows may abort early in pregnancy and become temporarily or permanently sterile.

Other organisms that have been isolated in herds free from Bang's disease and are regarded as causes of abortions are: *Vibrio fetus*, *Corynebacterium* (pus germs), *Mycobacterium avium* (cause of tuberculosis in chickens), *Aspergillus*, and *Mucor* (molds).

How can trichomoniasis be prevented? The most effective method to prevent trichomoniasis from getting into a herd is to purchase only disease-free animals from herds whose breeding history is known. There are no specific tests for diagnosing the disease. Laboratory examination of discharges and aborted fetuses are helpful.

DIAGNOSIS OF BRUCELLOSIS

What is the agglutination test? This is a laboratory test which will detect cattle affected with brucellosis. It is made by mixing a suspension of *Brucella* germs, the cause of the disease, with different amounts of blood serum from the animal tested. The mixture is then incubated at body temperature. Blood serum from normal cows has no effect on the germs, but small amounts of serum from infected cows will cause the suspension of germs to clump.

Blood is collected by the veterinarian from each animal, aseptic precautions being observed as described in Circular 348 of the Illinois Experiment Station. The veterinarian may conduct the preliminary tests or send the samples to a recognized laboratory where agglutination tests are made.

Is the agglutination test reliable? In skilled hands the agglutination test has proved as reliable for detecting animals infected with brucellosis as the tuberculin test has proved in detecting tuberculosis-infected animals. Occasionally heifers or cows heavy with calf may be infected and fail to react until after calving, but such instances are comparatively rare. Some infected animals are slow in developing

agglutinins; and animals that have been infected for many years may give only a slight reaction.

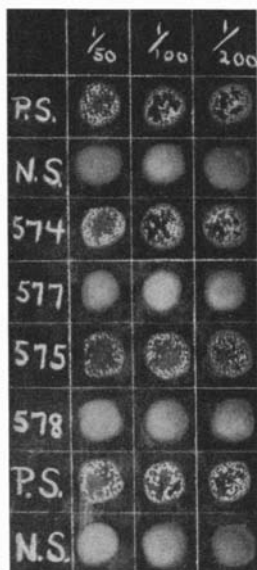
Do tube and plate tests give similar results? If these two agglutination tests are done accurately the results check very closely. The variations observed on some 5,000 samples tested by both methods were not significant. The tube test requires an incubation period of 24 to 48 hours. The rapid-plate method is dispatched in 3 to 8 minutes.

All *Brucella* antigen employed in testing cattle for brucellosis is prepared under government supervision and is standardized by the Federal Bureau of Animal Industry.

What is a positive reaction? When 1 part of blood serum diluted with 100 parts of *Brucella* antigen causes clumping or agglutination of the bacteria in the suspension, the reaction is regarded as positive. An animal whose blood serum agglutinates *Brucella abortus* in a dilution of 1 part of blood serum to 50 parts of bacterial suspension but fails to clump in a dilution of 1 to 100 or more is a doubtful reactor. The clumping of the bacterial suspension is visible to the unaided eye. No other agent will produce clumping except the specific antibodies in the blood of infected cows or those that have been vaccinated.

One test has no effect on other tests. The dilution in which agglutination occurs may vary in successive tests of the same reacting cow, but such variations are not necessarily indicative of the relative severity of the disease.

Is one blood test sufficient? After the reactors are removed and the herd has proved clean, annual tests seem to be sufficient. In the meantime it is advisable to retest all nonreacting animals at intervals of 30 to 60 days until two negative tests are obtained. A blood test may not become positive until 2 to 10 weeks or more



Clumping of the antigen in the rapid agglutination test indicates that the animal tested has brucellosis. Samples 574 and 575 show agglutination in all three dilutions. Samples 577 and 578 show no agglutination or clumping and are regarded as distinctly negative. In the routine application of the test a known positive serum (P.S.) and a known negative serum (N.S.) are checked with the antigen before and after testing the blood serum of an animal. If the known serums give the correct reactions, the results of the tests on the blood serum from the animal may be considered accurate. Each sample of serum is tested in dilutions of approximately 1 to 50, 1 to 100, and 1 to 200. Partial or incomplete reactors are retested by the tube method.

after the infection enters the body in the food or water. During the incubation period an animal may react negatively even tho it is harboring the germ.

Should reactors be retested? If there is any doubt regarding a reactor it is advisable to retest. Repeated tests may be necessary to determine the classification of some animals.

Is the milk test reliable? The milk test is reliable to the extent that a positive reaction has the same significance as a positive blood test. However, some animals that give a positive blood test may give a negative milk test.

PREVENTION AND CONTROL THRU HERD MANAGEMENT

Three main requirements. A clear understanding of the nature of brucellosis, accurate diagnosis, and simple preventive measures thoroly applied are the principal requirements for the suppression of brucellosis in cattle. Neither elaborate equipment nor expensive isolation quarters are needed. It is easier and less expensive to keep brucellosis out of a herd than it is to eradicate the disease after the herd becomes infected.

In an infected herd the procedure to follow will depend largely upon the number and the value of the animals affected. Essential measures of control can usually be made a part of the management in any herd of breeding cattle. Details can be advantageously worked out in consultation with a qualified veterinarian.

Testing and accrediting. Herds found free of brucellosis are accredited. Upon completion of two annual negative herd tests or three consecutive negative herd tests at intervals of six months, accrediting certificates stating that the animals are free from brucellosis are issued by the CHIEF VETERINARIAN, STATE DEPARTMENT OF AGRICULTURE, Springfield, Illinois. All animals six months old or older are tested. Accredited herds must be tested annually to retain the certification.

Isolate or dispose of infected animals. Poor-producing cows that are positive to the test for brucellosis should be marketed for slaughter. Doubtful reactors should be kept isolated at calving time and retested at 30- to 60-day intervals until their classification has been established.

In some herds containing a limited number of reactors of unusual value for breeding purposes it may be a distinct advantage to isolate these reactors for a time rather than to dispose of them immediately. There is always an element of danger, however, when reactors are kept in the herd, especially if infected cows are not isolated and quarantined at each calving.

Watch for spreaders. Cows affected with brucellosis probably do not, in the true sense, acquire immunity. They develop a tolerance to the disease and calve normally. Nevertheless, many of these infected animals, even tho they breed and reproduce normally, are potential spreaders of the disease at the time of calving. The herd owner must be alert to detect these animals.

In one herd made up entirely of reactors, breeding and calving records over a period of five years showed that 25 cows (39 percent) aborted once; 4 (6.25 percent) aborted twice; 4 aborted three times; and 1 aborted four times.

Give calves pasteurized milk. Newborn calves should have colostral milk, even tho it is from reacting cows. If they are allowed to nurse infected cows, the positive reaction of the calves, as judged by the agglutination test, generally disappears a few weeks after weaning. Altho calfhood infection is rarely retained up to the time animals reach breeding age, it is worth while to feed calves pasteurized milk because this will do away with the possibility of their spreading the disease to animals of breeding age.

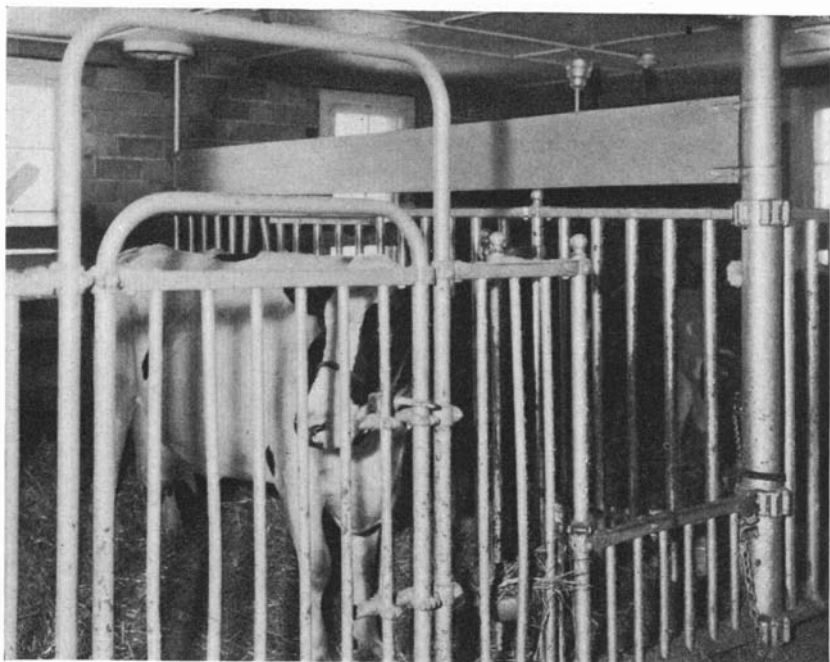
Isolate calves fed infected raw milk. Since feces from calves fed infected raw milk can spread the disease, such calves should, for 90 days after the feeding of infected milk is discontinued, be kept in separate quarters away from pastures used by mature animals and animals near breeding age. If a separate attendant cares for the calves it will prevent the infection from being carried to the other animals.

Prevent infection of cows by bull. Since bulls may spread brucellosis, community bulls should not be used unless all herds serviced are free from the disease. In herds where it is necessary for a non-reacting bull to service both reactor and nonreactor cows, several days should elapse between services. Artificial insemination of reacting cows is much better, however, for it will reduce the danger of spreading brucellosis. Discharging cows should not be bred.

Brucella-reacting bulls or those infected with any other genital disease should not be used for breeding purposes. Such bulls not only fail to settle cows but they may also spread genital infections, causing early abortion and sterility.

Consult the local veterinarian regarding breeding diseases of bulls.

Clean and disinfect contaminated premises. The place where an abortion has occurred should be cleaned and disinfected and all aborted materials burned. If the abortion takes place in a pasture, the area should be thoroly sprinkled with quicklime. An abortion in the barn necessitates the thoro cleaning and disinfection of all floors, sidewalls, gutters, and mangers. If the aborting cow has been isolated, it is only necessary to clean and disinfect the stall and equipment when the animal is removed. The manure should be placed on ground not used for cattle.



Isolation stalls should be provided for all animals but especially for reactors at calving time, since it is at this time that brucellosis can be most easily spread. Isolation quarters do not require expensive equipment. One end of the milk stable has been employed on some farms; box stalls in the horse barns may also be used. The quarters should be light, airy, and well ventilated.

For cleaning contaminated premises use *1 pound of lye to 20 to 30 gallons of boiling hot water*. After the surfaces are washed they should be sprayed with a disinfectant. Compound cresol (U.S.P.) 3 percent, or its germicidal equivalent, is very effective but its odor is likely to be absorbed by the milk. For this reason chlorin preparations are preferable.

Plow and crop contaminated barnlots. The most practical way to destroy brucellosis contamination in barnlots is by plowing and cropping. Poorly drained areas should not be used for barnlots.

Use only clean replacements in a clean herd. When a herd has become free from brucellosis, animals should be purchased only from disease-free herds. They should be open rather than pregnant, but in either case they should be tested. Pregnant cows or heifers should not be brought into the herd until they have given a negative reaction to the agglutination test 30 days after calving.

It is dangerous to add clean animals to infected herds.

CALFHOOD VACCINATION

What is meant by calthood vaccination? Vaccination of calves four to eight months old is a recognized aid in the control of brucellosis. It is done by injecting living *Brucella* germs (Strain 19)¹ under their skin in order to produce an active immunity to the disease.

Is vaccine distributed under supervision? Yes. A regulation of the Illinois State Department of Agriculture requires all manufacturers of vaccine to report their sales made in the state. Veterinarians use vaccine only under a permit issued by the Chief Veterinarian, State Department of Agriculture.

At what age should calves be vaccinated? Calves may be vaccinated at any time between four and eight months of age, but it is better to vaccinate them between the ages of six and eight months. The immunity induced is believed to last longer if the calves are vaccinated during the later period.

Why should vaccination be limited to calves? Calves are more resistant to brucellosis than mature cows, and a high percentage of the vaccinated calves become negative to the agglutination test before they reach breeding age. If mature animals are vaccinated, they may remain reactors for an indefinite period. Vaccination of pregnant animals may cause abortion.

Do vaccinated animals react to the test? Yes, vaccinated calves give a positive reaction to the agglutination test after vaccination. If they do not, the potency of the vaccine is questionable and the calves should be revaccinated. A high percentage of vaccinated calves will give a negative reaction within six to eight months.

Should calves in clean herds be vaccinated? This is not recommended because a small percentage of the vaccinated calves may continue to react. Vaccination reactors that do not become negative within six to eight months are under the jurisdiction of the State Department of Agriculture.

Can calthood vaccination be substituted for sanitation and testing? No, it is an addition to the testing and sanitation program and cannot replace it. Testing is necessary to determine whether the herd is infected and to what extent. In an infected herd testing aids in selecting the animals to be bred and the cows to be isolated at calving.

Does calthood vaccination prevent all abortions? No, it has no effect on abortions due to causes other than brucellosis.

When should calthood vaccination be practiced? It should be practiced in herds in which the test and slaughter plan is not desired

¹Strain 19 is a living vaccine developed in the laboratories of the Bureau of Animal Industry, U. S. Department of Agriculture, from a culture of the *Brucella* organism of low virulence.



Clean calves, such as these, can be reared from cows infected with brucellosis. Young calves are highly resistant to the disease and will usually become free from it in less than 90 days after the milk-drinking period if they are kept separate from the herd. Isolation of young calves receiving milk from infected cows is especially necessary because they may be a means of spreading the infection to susceptible breeding animals when they pass the germs in their feces.

or in herds where valuable reactors breed normally and are needed to rebuild a clean herd.

DANGER TO OTHER ANIMALS AND PUBLIC HEALTH

Swine susceptibility. Judging by the agglutination test, brucellosis of cattle is transmitted with difficulty to sows. In natural outbreaks of swine abortion the germ known as *Brucella suis* is generally involved. It resembles *Brucella abortus* of cattle and belongs to the same group of germs, but is nevertheless a separate and distinct type. Altho none of the outbreaks of swine abortion observed by the Illinois Experiment Station has been definitely traced to the *Brucella abortus* type of germ found in cattle, there may be an element of danger in feeding raw milk from infected cattle to pregnant sows.

Possible danger to sheep and horses. Occasionally sheep may suffer from the cattle type of the disease. However, a separate type of infectious abortion has been encountered in sheep that is not related to brucellosis of cattle. A few cases are on record of mares suffering from the cattle *Brucella* germ, but the majority of abortions occurring in mares have no connection with this germ. Experimental data suggest the possibility that the *Brucella* germ is associated with fistula and poll evil in horses.

Cause of undulant fever in man. Raw milk from brucellosis-infected cows should always be regarded as dangerous for human food because it may cause human brucellosis, known as undulant fever. If the milk is carefully pasteurized for thirty minutes at 145° F. (64° C.), the germ will be destroyed.

There is evidence that the swine as well as the cattle strain of the *Brucella* germ is a common cause of undulant fever, especially in Illinois and other midwestern states. Exposure to brucellosis is brought about by careless handling of the aborted calves and pigs, or of the afterbirths and discharges from infected cows and sows, or by contact with infected meat products. The danger of infection from meat can be eliminated by cooking it thoroly.

FEDERAL-STATE PROGRAM OF CONTROL

The Federal-State program for bovine brucellosis control, in operation since 1934, was started as a dairy reduction program, reactors to blood tests being slaughtered or otherwise disposed of. Thruout the United States more than 48 million blood tests on cattle in over a million herds were made during the first seven years the project was in operation. There are now more than 5 million dairy and breeding cattle in 560 counties of 24 states that are recognized as free from brucellosis. One hundred fifty-one more counties in 18 states are working toward accreditation. In Illinois alone more than 13,000 herds, including over 200,000 cattle, had been tested up to February 28, 1942. On the basis of federal tests showing the herd to be free from Bang's disease, owners in Illinois obtained state certificates accrediting their herds.

Three plans are now available for brucellosis control in this state. These are offered without expense to the herd owners, but no indemnity is provided for reactors. The plans are described in the Federal-State agreement reproduced below:¹

¹For copies of brucellosis-control plans and enrollment blanks write the CHIEF VETERINARIAN, STATE DEPARTMENT OF AGRICULTURE, *Springfield, Illinois*, or the INSPECTOR IN CHARGE, U. S. BUREAU OF ANIMAL INDUSTRY, *Springfield, Illinois*.

BANG AND CALFHOOD VACCINATION CONTROL AGREEMENT
DEPARTMENT OF AGRICULTURE DIVISION OF LIVESTOCK INDUSTRY
STATE OF ILLINOIS

Cooperating with

BUREAU OF ANIMAL INDUSTRY U. S. DEPARTMENT OF AGRICULTURE

In order that I may know whether Bang's Disease [brucellosis] is present in my herd and if so, be able to adopt one of the plans listed below for the control of this disease, I hereby make application for a Bang's Disease test. It is understood that I have the option, when the initial test is concluded, to select one of the following plans:

Plan I is strictly a test and slaughter plan and is identical with the plan which has been in effect for the past few years.

Plan II allows the herd owner to place his herd under the test and slaughter plan and also to vaccinate his calves.

Plan III allows the herd owner to retain his reactors in the herd and to build up a clean herd by the vaccination of his calves.

It is understood that the test will be made without expense to me except for the handling and confining of my herd at the time the veterinarian notifies me he will be at my place to make the test. It is further understood that should I choose to use vaccine after determining whether my herd is infected with the disease, then if the owners of more than 50% of the breeding and dairy livestock in my county have signed this agreement and state and federal funds are available to bear the expense of such test and vaccine, vaccine will be administered to my calves between the age of four and eight months without expense to me for the vaccine or administration at the time of the first test of my herd. It is further understood that there will be no state or federal indemnity paid in case of reactors on the initial test.

I agree not to dispose of reactors and positive vaccinated calves (calves between the ages of four and eight months, vaccinated under veterinary supervision and identified in accordance with state regulations will not be classified as reactors unless, at the time they become 30 months of age, they react to the agglutination test to brucellosis in a dilution of 1-100 or higher) except by permit from the Division of Livestock Industry, Department of Agriculture, State of Illinois, Springfield, Illinois.

My premises are located in—County..... Township.....

Section..... Farm Number..... Distance and direction from

the nearest town.....

The name of the herd veterinarian is.....

Description of Herd

Breed.....	Purebred	Grade	Total
Number of Females over six months
Number of Males over six months
Number of Cattle under six months

.....
 Signature of Owner

.....
 Address of Owner

.....
 Date