



KEY DETERMINANTS IN SUCCESSFUL BRUCELLOSIS AFFECTED HERD MANAGEMENT

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AFFECTED HERD MANAGEMENT

Once brucellosis has been diagnosed in a herd in the United States, since the country is almost free of brucellosis in domestic cattle, the herds are generally depopulated. However, in some cases and in some parts of the world, depopulation is not an option. In those cases, successful elimination of the disease depends on the development of a herd plan of action that will combine sound epidemiological practices with good animal husbandry practices, with the goal of eradicating the disease in the herd and preventing its reintroduction. This involves far more than just blood testing the herd and removing positive animals. Prior to actually developing a written herd plan, it is imperative to establish a good working relationship with the owner. This involves developing and utilizing good communication skills from the onset. Cooperation will be enhanced by maintaining open lines of communication, and by being available to handle questions or problems as they arise.

DEVELOPMENT OF A HERD PLAN

Background:

Before attempting to formulate a herd plan, it is very important to obtain as much information as possible on both the disease and the individual herd situation. There are three critical areas of information that if obtained, can greatly enhance the quality of the herd plan.

1. The Technical Area:

A working knowledge of the pathogenesis and epidemiology of brucellosis is important. The transmission, incubation, and dynamics of the disease must be well understood and conveyed to the owner in layman's terms.

Details of the brucellosis program itself must be known. Knowledge of specific program details such as resources, laboratory support, indemnity, etc, is essential. Legal and



administrative requirements must be conveyed to the owner and incorporated into the herd plan.

2. The Herd Owner:

The key to the success of any herd plan is the herd owner. The owner's attitude and interest will determine to a large extent the effectiveness of the herd plan. It is important to be aware of the economic impact that brucellosis in a herd will have on the owner, both now and in the future, and be sure to consider that impact in developing the herd plan.

Prior to initiating contact with an owner, it is wise to look into any previous dealings animal health officials have had with this owner, including his previous concerns, attitude, and any particular problems or situations. It is important to review past herd plans and histories if the herd has had previous infection.

It is important to open the lines of communication with the owner. This may often be difficult initially as owners are often stunned and angered to learn their herds are potentially infected with brucellosis. Animal health authorities can usually best develop an open channel of communication by actively working to listen before speaking. Owners may need to vent frustrations or express their displeasure before they will listen to what officials have to say. Once they have had the opportunity to express themselves, they are usually more willing to discuss.

To continue the necessary communications during the duration of working to eliminate the disease from an affected herd, it is critical to open the door for two way conversation. The owner must know that his thoughts and opinions are important during the planning process, and should be encouraged to ask questions. Herd owners should be provided a phone number of a contact person to reach should they have questions or concerns. In many cases, it is wise to arrange for a follow-up discussion soon after the initial contact is made so as to give the owner time to reflect and come up with questions.

Even though management of a brucellosis affected herd may be dictated by specific rules, regulations or laws, in reality, successful elimination of the disease from a herd and a community relies on cooperation from herd owners. This cooperation is dependent on a thorough understanding by both parties from the onset, and results from good communication throughout the process. The herd plan should be developed



together with the owner, taking into consideration his concerns and his ability and willingness to implement the components of the herd plan.

3. The Infected Herd

To initiate the development of a herd plan, some background information must be obtained. This includes: 1) the history of brucellosis in the area, 2) the history of brucellosis in the herd, and 3) the kind of herd involved (i.e. dairy vs. beef).

Extrinsic information relative to the herd must be obtained, including: 1) purchases and sales of livestock, and 2) the status and relationship of adjacent, neighborhood, and other contact herds.

Finally, some intrinsic information should be obtained, including such factors as:

1. Size and concentration of the herd.
2. When and how the herd became infected.
3. Whether abortions or infective calvings have occurred and, if so, where.
4. Breeding practices (seasonal or otherwise)
5. Calving practices (herd hygiene)
6. Management practices
7. Vaccination status (assessment of herd immunity), and
8. Herd stability (numbers of animals moving in and out of the herd)

Once the background information on the herd is obtained, the next step is to obtain information relative to details of the brucellosis outbreak. This information should include: 1) how the outbreak was disclosed, 2) the percentage of the herd found infected, and which units, 3) a detailed history of the positive animals - origin, calving history, vaccination history and 4) clinical signs.

Herd Plan Objectives:

The herd plan should be designed to manage the disease problem, not just to test cows. Its purpose is to eliminate the disease within the herd and to prevent reintroduction of disease into the herd. The plan must be individually tailored to each herd to allow for variation in herd size, ability to test, calving season, and a myriad of other factors. Although herd plans may be unique and quite variable, they must always be based on sound epidemiological principles and must be workable and realistic. It is



pointless to develop a herd plan listing ideal goals if they are not achievable. Although there are many factors that may be addressed in an individual herd plan, the plan should minimally address the following key issues:

1. Calving management
2. Vaccination practices (whole herd and/or calfhood)
3. Heifer management
4. Herd replacements
5. Testing schedules
6. Quarantine restrictions
7. Removal of positive animals

The herd plan should be evaluated at least annually, more often if there is evidence that the plan is ineffective or unworkable as is.

HERD PLAN ELEMENTS

Farm Diagram:

A diagram of the layout of the farm should be developed that should show locations of all pastures, pens, and groups of cattle. It should also show the types and ages of cattle and their relationships geographically to each other. This diagram can then be used to develop property options available for use in managing the infected herd. It is also important to show adjacent herds on this diagram, as they will need to be addressed as well.

Calving Management:

This is the single most important part of the herd plan because the pathogenesis and epidemiology of brucellosis are centered around the time of parturition. There are several options related to calving management that can be utilized to minimize the transmission of brucellosis. Stopping the transmission of the disease is the first step in eliminating it from the herd. These options include:

1. Seasonal breeding

This is an excellent brucellosis management procedure, especially in beef herds. If practical, the breeding and subsequent calving seasons should be reduced to three



consecutive months. This reduces the constant exposure that occurs with year-round calving. Intense disease management efforts are then needed to be implemented in only a few months of the year, at or near the time of calving, as opposed to year-round.

2. Dividing the herd into smaller groups

This dramatically reduces the probability of exposure, as fewer animals are exposed when an infectious calving or abortion occurs. For example, dividing an infected herd in half reduces the relative exposure potential by 50%. If an infected animal aborts, only half the animals would be exposed as opposed to the whole herd being exposed. Further dividing the herd based on stage of gestation, can reduce exposure potential even further.

Heifers in their first pregnancy are more much susceptible than older animals, therefore young breeding animals should be maintained separately from older ones if possible.

3. Separation just prior to and at calving

Nearly all transmission of brucellosis occurs at time of abortion or calving, or shortly after, therefore cattle in the last half of pregnancy are the most dangerous. A major portion of exposure potential can be circumvented by isolation of animals at the time of calving or abortion.

4. Restriction of fresh cows (those that have just calved)

Infected cattle may discharge organisms for up to 30 days post-partum, therefore all fresh cows should remain separated from susceptible animals until discharges from the reproductive tract cease. Occasionally, some cows may discharge brucella longer than 30 days; however, the number of organisms is usually low and not sufficient to induce infection in the rest of the herd.

5. Disposal of placental tissues and aborted fetuses

In brucellosis affected herds, these materials have a high probability of being contaminated with viable brucella organisms. Adult female cattle are naturally attracted to these materials; therefore proper disposal is critical in controlling spread of the disease. This is especially important in dairies with a high density of animals. It is also important to ensure that dogs and other animals do not have access do these materials



as they can be mechanical vectors for transmission by dragging these infective materials to other parts of the farm and exposing susceptible cattle.

Herd Immunity:

1. Calfhood vaccination

The herd plan should include vaccination of heifer calves, preferably with RB51 vaccine, which will not interfere with diagnostic tests. In the United States, it is legal to vaccinate heifers at 4-12 months of age. However, it is best to vaccinate at 4-6 months of age in affected herds. Vaccinating at this age ensures heifers are vaccinated before they reach sexual maturity, thus increasing their resistance during the time when they are more susceptible.

2. Whole herd vaccination

The concept of whole herd vaccination includes the use of both calfhood and adult vaccination, resulting in the vaccination of all eligible females in an infected herd which increases the overall herd immunity. Adult vaccination slows or stops abortions, which is especially useful in herds that cannot be gathered as frequently for testing and removal of reactors. Adult vaccination has proven to be an invaluable tool in the control and eradication of brucellosis, especially in problem herds. Mass adult vaccination was undertaken in Florida, a heavily infected state, in the mid- 1980s and combined with herd management, resulted in a rapid decline in affected herds shortly afterwards.

It is important to note however, that vaccination is only ONE tool in the management of brucellosis. Vaccination alone will not eliminate brucellosis. To be effective, vaccination must be used in conjunction with herd management efforts designed to reduce transmission.

Heifer Management:

Ideally, in beef herds, heifers should be removed from the herd and sold to slaughter. (See below for dairy heifers). Heifers from affected herds should not be retained as breeding animals due to the "latent heifer" syndrome. Although infected, these animals may test negative until after they calve. At that time, if they are tested and finally identified as infected animals, they have already calved and potentially reinfected the herd.



If the owner refuses to sell the heifers from these herds, the second best option is to isolate the heifers and maintain them under quarantine until they have had a negative post calving test.

The final, and least desirable way to manage heifers is to leave them in the herd, with the whole herd remaining under quarantine until the heifers have calved and the entire herd has had a negative post calving test. Although unbred, open heifers constitute virtually no risk as far as spread of disease is concerned, once they are bred, they are a potentially significant danger to the herd. Therefore, heifers out of an affected herd should never be retained as breeding animals.

Herd Replacements:

As mentioned, heifers out of infected herds, especially heifers out of positive dams, should not be kept as replacement animals. In fact, it is best to not add breeding stock to an affected herd if it can be avoided. The reason is that new, naïve animals added to the herd will have a lower level of resistance and have an increased likelihood of becoming infected, thus perpetuating the disease.

If is necessary to add animals, it best to purchase them from known-negative, preferably brucellosis certified-free herds. Purchased additions should be tested and found to be negative before being added to the herd, and should be calfhood vaccinated at the appropriate age. Animals being added to adult vaccinated herds should be tested and adult vaccinated prior to being added. It is important to recognize that animals added to a quarantined herd assume the quarantine status of the rest of the herd.

Testing Schedules:

Testing schedules must be tailored to the individual herd. It is best to work within normal management schedules if possible as herd owners will be more likely to cooperate with testing if they do not have to gather the animals an extra time. However, the ability to test is often affected by the size of the herd, terrain, weather, calving season, and economics.

1. Routine herd tests



Generally, a 30 day retest interval works well due to the incubation period of brucellosis. If abortions are occurring, a 15 day test interval should be considered as a means to break the abortion cycle.

Regardless of the testing schedule decided upon, always consider increasing the frequency of testing with evidence of continued spread, abortions, high incidence of disease, and/or lack of a good vaccination history.

2. Tests of special groups of animals

The testing interval should fit the disease situation and risk within the particular group. Aborting animals and animals with suspicious titers should be isolated and tested more frequently than the regular herd tests. Other special groups of cattle that might indicate a variation in testing schedule based on risk might include third trimester cattle, open females, young first-calf or unbred heifers, bulls, and those not known to have been exposed.

3. Tests of young, open heifers

Although open, unbred heifers are actually no risk as far as disease spread is concerned, they also frequently fail to disclose titers when exposed, either prenatal or postnatal. Therefore, if exposed heifers from infected herds are retained, consider testing them periodically until at least 30 days after their first calving. If limited in testing opportunity, at least schedule a pre-calving and post-calving test.

4. With very large operations, may need to prioritize herds for testing.

Identify those animals that were exposed to infected animals, especially at calving, and test those first. Testing the dry cows should be a high priority; they will potentially do the most damage the soonest.

Removal of infected animals:

It is critically important to remove positive animals from the herd as soon as possible. If they are not to be slaughtered immediately, provisions should be made for strict isolation. Details on how positive animals will be identified and handled should be outlined in the herd plan.



QUARANTINE RESTRICTIONS

The herd plan should specify which classes of animals are quarantined. It is important to be sure the owner understands what he can and cannot do with certain animals. Animals not included in the quarantine, such as steers, and spayed heifers, should be listed.

Procedures for Movement of Restricted Animals:

The herd plan should include information as to how the owner can legally sell animals. It should include the names and phone numbers of persons who can process and release cattle for sale.

Requirements for Quarantine Release:

A quarantine should never be issued until the steps or criteria needed to remove the quarantine are clear. The herd test requirements and time frames should be clearly outlined. Any exceptions for certain groups or classes of cattle should be clearly stated.

POST QUARANTINE RELEASE TESTING

It is generally recommended that affected herds be kept under quarantine a minimum of 6 months after removal of the last reactor. In the United States, affected herds that are not depopulated are kept herds under quarantine for one year. It is best to get a negative post-calving test before releasing the quarantine. ***It is further recommended that affected herds be retested six months after the quarantine has been released.*** This has proven to be very effective in preventing reinfection of the herd caused by long incubating animals.

It is a good idea to consider doing 2-3 post quarantine release (PQR) tests if there is any doubt that the herd is cleared of infection, especially if heifers have been retained in the herd. An additional PQR should be considered if the herd is extremely large or is difficult to gather due to rough terrain as cows can easily be missed when those herds are gathered for testing. Although it is easy to match eartags on smaller herds to be sure all have been retested, it may not be possible to account for each animal in herds that number in the thousands. Owners assume they'll lose several due to death losses, but it's still a good idea to do another PQR to be sure those "dead" cows aren't actually hiding in the woods or elsewhere. They may turn up on a second PQR.



OTHER CONSIDERATIONS

Human Infection Potential:

Brucellosis causes serious disease in humans, therefore it is important to be sure to outline procedures that will prevent, or at least minimize, human exposure. Proper handling of infected animals and material such as placentas and/or aborted materials should be addressed. Herd owners and their families should be cautioned against drinking raw milk.

Community Herd Protection, Evaluation, and Testing:

1. Community herd protection

The herd plan should include the things that the herd owner can and will do to help keep the disease from spreading to neighborhood farms.

2. Community herd evaluation and testing

The proximity of other cattle should be determined and any that may be at risk of having been exposed to the index herd should be tested. A minimum circumference for testing around the index herd should be determined (such as a two kilometer or so radius), but the testing area should not be restricted to that if other factors (such as downed fences) indicate that herds further out should be tested. In evaluating the risk of spread to community herds, consider such factors as terrain, natural boundaries such as rivers or mountains, fence condition, and the presence or absence of other physical barriers.

Occasionally, cows that are thought to have died turn up later on subsequent tests. (A good reason to do second PQR tests!) Therefore, it is very important to continue to revisit the status of the vicinity herds frequently. The status of community herds should be revisited at least all the way through the PQR testing time frame of the index herd.

General Husbandry:

The use of certain husbandry practices should be encouraged to help prevent the spread of disease within the herd. Animals should be fed in troughs or bunks, not on



bare ground where feed can become contaminated. Also, watering facilities should be structured and arranged so as to avoid contamination. Placentas, aborted materials, or dead calves should be disposed of immediately. The best disposal methods are by burial or burning. Pens and equipment that have been contaminated by abortions or calving of infected animals should be cleaned and disinfected.

DAIRY HERD SPECIAL CONSIDERATIONS

Dairy herds are maintained and managed differently than beef herds, and therefore present some unique management problems in dealing with brucellosis. The principles presented thus far generally apply to both beef and dairy herds. The following information addresses some of the exceptions that apply to dairy herds.

Unique Features:

1. Size and concentration

Dairy herds are usually larger herds than beef herds. Concentration is the most important feature in terms of potential for introduction and spread of disease. Large herd size combined with the fact that animals are maintained in very close contact virtually 24 hours a day compounds disease management problems.

2. Instability - dynamic herd population

Generally, the economically useful life of dairy cattle is significantly shorter than that of beef cattle, which results in a pressing continual need for replacement animals. The constant addition of replacements adds greatly to the risk of diseases being introduced, and to the potential for spread.

3. Management - Quite complex in large, modern dairies

It is especially important when managing brucellosis in dairy herds to be sure to obtain a complete map showing the layout of the premises and movement of animals before attempting to develop a comprehensive herd plan. It is important to completely understand the specific management scheme of the dairy in order to work with it.

Dairies frequently are allowed to grow to the point where they exceed the physical, fiscal, or human resources necessary to properly manage them. When this happens,



compromises are made that can markedly increase the risk of disease spread within the herd. In the development of a herd plan, it is important to be alert to this possibility and be prepared to deal with it.

4. Calving Management

Dairies generally have year round calving, as opposed to the tendency towards seasonal calving with beef herds. Calving management is critical since that is the time brucellosis is spread, and is especially critical in dairies where animals often calve in close proximity to each other.

5. Maintenance of a dry herd

The dry cow herd contains the most susceptible animals in the herd, and potentially the most dangerous in terms of spread, therefore this herd requires the most attention and management. It is wise to separate the dry herd into smaller groups based on how close they are to calving. These animals should be observed closely, especially those within two weeks of parturition. Those close to calving should be put into close-up pens where they can be observed several times daily.

6. Calving procedures

When calving is imminent, cows should be placed into individual pens, isolated from the other cattle. Calving pens should have solid floors that can be cleaned and disinfected. Walls should be solid and high enough to prevent the transfer of brucellosis contaminated material.

After calving, cows should be left in calving pens until the placenta has passed and most vaginal discharge has ceased. Placentas and aborted fetuses should be removed promptly and destroyed. Calves are normally removed from the dam and raised apart from the herd.

7. Maintenance of a fresh cow herd

Ideally, cows removed from the calving pens should be placed in a fresh cow herd. This limits the potential for spread of brucellosis during involution of the reproductive tract to a relatively small group of cattle. A good management procedure is to require a negative brucellosis test on fresh cows before adding them back into the milking herd.



Variable Test Schedules:

Well managed dairy herds will contain groups of cattle with widely varied levels of risk for spread of brucellosis. A well constructed herd plan utilizing variable test schedules among the different groups will reduce the time and resources required for testing, as well as losses from milk production, yet will still allow for progression of the eradication efforts. Several groups of animals that may require special handling are as follows:

1. Heifers

Very young, unbred heifers are no problem. Older, bred heifers may have problems from "latency syndrome". In infected dairies, heifers raised in the herd, including calfhood vaccinates, should initially be tested at about one year of age. This first test may detect some latently infected animals and will provide a valuable baseline titer for future test reference. Such heifers should be tested again at breeding, or shortly thereafter.

Beginning at mid-gestation, heifers should be tested at 30-60 day intervals, including a negative test after calving, before entering the milking herd. Should known exposure to abortions or infective calvings occur, exposed heifers should be tested at the same intervals as the dry cows.

2. Dry cows

This is the highest risk group, as this is where most exposure and transmission occurs. The testing schedule for this group of animals should be determined by the disease situation and the quality of calving management. Testing intervals may be as short as 15 days, or even a week, under certain conditions. The purpose of testing these animals more frequently is to detect and remove infected animals before they abort or calve and further spread the disease.

3. The milking herd

Initially, it is best to test the milking herd at 30 day intervals. If the herd is whole-herd vaccinated and the disease situation warrants it, it may be reasonable to test at 60 day intervals. However, should abortions occur, a more vigorous test schedule is necessary.



4. Purchased replacements

The status of the herd of origin may not be known. Purchased replacements should be calfhood vaccinated and tested negative before being added to the herd. If the herd is whole herd vaccinated, these animals need to be adult vaccinated before being added to the herd. Replacement animals should then be retested on the same schedule as that of the group to which they are assigned.

Vaccination (Brucella abortus, strain RB51):

1. Calfhood vaccination

Heifer calves should be vaccinated at 4-6 months of age. Early vaccination reduces the time prior to vaccination in which field infection may occur.

2. Adult vaccination

Adult vaccination should be considered very early in the herd plan for affected dairy herds, as it slows or stops abortions, and increases herd immunity.

Human Exposure Potential:

Although this has already been discussed, it needs to be reiterated here as dairy herds have a far greater potential for transmitting brucellosis to humans than do beef herds, due to the larger number of employees who work closely with the animals on a daily basis. Owners, employees, and their families should be warned about the dangers of drinking raw milk from an infected dairy. Herd plans for infected dairies should include precautions to take to prevent human exposure.

CONCLUSION

Management of a brucellosis infected herd can be a very complex undertaking. It is critical to evaluate each herd individually and to tailor the herd plan to the herd. It is also critical that the lines of communication between the owner, the veterinarian, and the epidemiologist stay open, and that constant two way communication is encouraged.