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# MANAGEMENT OF INFECTIOUS REPRODUCTIVE DISEASES IN BEEF CATTLE HERDS

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Reproductive diseases are the greatest disease threats to the production and profitability of beef cattle herds. Infection by reproductive tract pathogens results in a wide array of losses including *embryonic deaths, abortions, stillbirths and weak calves*. Abortions are the visible tip of the iceberg in reproductive tract infections. Embryonic deaths appear clinically as repeat breeders and low pregnancy rates. Devastating losses occur when a reproductive tract pathogen is introduced into a naïve herd, often reducing pregnancy rates to 40 or 50 percent. Thereafter, they can cause losses in a cyclic pattern: great losses one year followed by several years of minimal loss, then major losses again. *Low reproductive performance robs a beef herd of profitability.*

**There are 4 parts to a successful program to control infectious reproductive diseases in beef herds:**

1. *Maintain a high level of general resistance to infectious disease.*
    - Proper nutrition*:* including minerals (especially those needed for a strong immune system - copper, selenium and zinc).
    - Minimize stress*:* avoid crowding – don't mix first calvers and adults.
    - Control internal and external parasites.

2. *Keep infectious agents out of the herd*
    - Purchase animals from well-managed, reputable herds.
    - Test purchase animals for carrier state - Prior to purchase!
    - Quarantine purchased animals on arrival.
        - 60 days – no nose to nose contact.
        - Administer vaccines, treat for parasites and give LA-200 to eliminate *Leptospira* hardjo-bovis carrier state.

3. *Minimize spread of infectious agents within the herd.*
    - Identify and cull carrier animals.
    - Isolate sick animals – bury dead animals.
    - Don't use same equipment for feed and manure handling.
    - Reduce wildlife reservoirs of neosporosis.

4. *Maintain a high level of specific resistance to infectious disease.*
   - Proper vaccination program: especially for bovine viral diarrhea (BVD) and *Leptospira borgpetersenii* serovar hardjo-bovis.

**All 4 parts of the program are necessary for its success!!**

This article gives general principles on control of infectious reproductive diseases in beef herds. There are many details to the *design* and *implementation* of a successful reproductive disease control program. It must be stressed at the onset that **a specific herd's reproductive disease control program should be based on the herd's unique management practices and knowledge of the diseases that are a significant threat to the herd.**

There are 7 reproductive pathogens that are of main concern because they each are capable of inflicting major disease losses in a beef cattle herd. They are *Brucella abortus, Leptospira* hardjo-bovis, *Campylobacter fetus*, infectious bovine rhinotracheitis (IBR) virus, bovine viral diarrhea (BVD) virus, *Tritrichomonas foetus* and *Neospora caninum*. A discussion of practical control measures for of each of these diseases follows.

## Brucellosis

*The Disease* - We've come a long, long way in eradication of this bacterial reproductive disease since the late 1960's when a negative herd was rare in most Texas counties! Even though this disease is almost eradicated, we *must continue our control programs* well into the future years.

*Control Program* - Control of brucellosis in beef herds will continue to be based on **calfhood vaccination and biosecurity**. Continue calfhood vaccination and only purchase brucella-vaccinated females, preferably from Brucella Certified herds or females who have been tested for brucellosis before purchase. Bulls should be required to pass a brucella test prior to purchase.

## Leptospirosis

*The Disease* - There are many different leptospira organisms that can potentially infect cattle. Five of the most common ones are included in the 5-way leptospirosis vaccine which contains *Leptospira Pomona, L. hardjo, L. canicola, L. icterohemorrhagica* and *L. grippotyphosa*. Over the past 30 years, hardjo-bovis infection has emerged as the most common cause of reproductive losses in North American cattle caused by leptospiral organisms and there's lots of it in Texas! Transmission of infection is very efficient: chronic carrier cows harbor the bacteria in their kidneys and shed massive numbers of organisms in urine. A recent survey of Texas beef herds found cows shedding hardjo-bovis in 6 of 12 herds (50% prevalence).

*Leptospira* hardjo-bovis has become widespread in our cattle population, inflicting significant reproductive losses. The reason for its unchecked rampage is that while our 5-way leptospira vaccines have provided moderate protection against most leptospira serovars, they give *minimal protection against hardjo-bovis.* They do not

contain that organism! They contain *L. interrogans* serovar hardjo (hardjoprajitno) which is present in Europe, not North America, and gives little cross protection against our form of hardjo, (hardjo-bovis). Fortunately, a highly effective vaccine against hardjo-bovis (*Spirovac*® - Pfizer Animal Health) has recently become available in the United States. At this time, it is the only vaccine available in the U.S. that has been proven to be effective against hardjo-bovis.

*Control Program* – This disease is widespread in Texas beef cattle herds and *a control program is highly recommended.* Prevention of losses due to hardjo-bovis infection in beef herds is based on a combination of **biosecurity, antibiotic treatment to eliminate the carrier state and vaccination**. Sampling and testing for the hardjo-bovis carrier state is time-consuming and expensive. To keep from introducing the infection into a herd, purchased animals should be kept separate from the herd for the standard quarantine period of 60 days and handled as if they were hardjo-bovis carriers instead of testing for carrier status. Upon arrival, they should be placed in isolation from the herd (no nose to nose contact), treated with LA-200 which clears the carrier state and given a primary vaccination with Spirovac. Four weeks later they should receive a booster vaccination with Spirovac. They can be introduced to the herd at the end of their quarantine period.

Control of hardjo-bovis within the herd is accomplished by *antibiotic treatment to eliminate the carrier state and vaccination.* The program is designed to insure that carrier animals are not present in the herd and that cattle in the herd have a protective degree of immunity against hardjo-bovis. The older calves are, the more likely they are to be renal carriers. Also, the more contact that calves have with adults, the more likely they are to be carriers of hardjo-bovis. Thus, at a young age, calves must be treated with LA-200 to eliminate the possible carrier state and given their primer vaccination. In 4 to 6 weeks they should receive a booster vaccination.

In beef herds, a practical control program could be to administer LA-200 and a primer vaccination to calves at weaning and then give a vaccine booster 4 to 6 weeks later. Thereafter, they and adults should receive an annual booster vaccination.

The first year of a herd control program, in a beef herd all yearlings and adults could be treated with antibiotics to eliminate the carrier state and given their primer vaccination. Four to 6 weeks later, the entire herd should receive their booster vaccination. Thereafter, calves should be started with antibiotic treatment and primer vaccinations at a young age and adults should receive annual boosters. An alternative approach would be to limit antibiotic treatments to yearlings and calves at weaning and rely solely on vaccination in adults.

To protect the herd against the other leptospiral organisms, the 5-way leptospira vaccine must continue to be administered to the herd unless the just introduced Spirovac vaccine that contains the other leptospiral organisms plus campylobacter is used. It should be given to heifers at first working and then boostered at weaning and 1 month prior to breeding.

## Campylobacteriosis (Vibriosis)

*The Disease* - Vibriosis is a bacterial venereal disease of cattle characterized by embryonic deaths which appear clinically as repeat breeders and low pregnancy rates. Abortions occur occasionally, usually between the 4th and 7th months of gestation. Bulls become infected from breeding an infected cow and then pass the infection to a naïve cow during breeding. Young bulls (under 3 to 4 years of age) tend to have transient infections of hours to days while older bulls (4 to 5 years and older) become life-long asymptomatic carriers. Cows are capable of mounting an immune response and clearing themselves of the organism. The resistance is temporary, however, and re-infection is possible 3 or 4 months later. In herds with long breeding seasons (6 months or more), this phenomenon can result in a pregnancy pattern characterized a cluster of pregnant cows the first month or so of the breeding season followed by 2 or 3 months of a few scattered pregnancies and then another cluster of pregnancies the last 2 months of the breeding season.

*Control Program* - Vibriosis is widespread in the cattle population of Texas. It can be **controlled very effectively by vaccination**. *All herds must vaccinate their cattle against Campylobacter fetus!* An **oil-based vibriosis vaccine** results in the longest lasting immune response and a single dose is effective with no advantage to using 2 injections initially. Unfortunately, oil-adjuvanted vaccines cause swellings at the vaccination site due to formation of granulomas and fibrosis. Replacement heifers should be vaccinated 1 month prior to the start of their breeding season. Cows should be given an annual booster, preferably 1 month prior to breeding, however, annual boosters given at pregnancy examinations have been found to provide adequate protection. Bulls should receive two-5ml doses of oil-based vaccine (21/2 times the cow dosage) at 4-week intervals beginning 8 weeks before the start of the breeding season. This has been shown to not only prevent infection in bulls, but to clear infections from carrier bulls.

## IBR and BVD Viruses

*The Diseases* – These 2 viruses are discussed together because infection of cattle with either of them results in early embryonic deaths, abortions, stillbirths and weak calves. In addition, BVD virus infection can result in birth defects, especially cerebellar hypoplasia. Calf crops are reduced due to lower pregnancy rates, abortions and higher calf mortality rates. Also, weaning weights are reduced due to infection of calves with these viruses during the nursing period.

Herds become infected with these viruses by purchasing chronically infected animals who spread the viruses throughout the herd. Calves are born persistently infected (PI) with BVD virus when their non-immune dams become infected with BVD virus at 42 to 125 days of gestation. PI animals shed massive amounts of BVD virus into the environment. About 50% of the PI calves die by 1 year of age, however, the rest survive longer. Some become pregnant replacement heifers and infect new herds when sold to a naïve ranch. Introduction of a PI animal into a naïve herd results in serious losses from BVD virus infection.

*Control Program* – Prevention of infection of beef herds with these viruses is based on **biosecurity and vaccination.** Biosecurity involves not buying an animal

persistently infected with BVD virus! The best test for PI status is immunohistochemistry on skin biopsies collected with pig ear-notchers. All *herd additions should be tested for PI status* for BVD virus prior to purchase. Purchased heifers must ***remain in quarantine until they have calved*** *and* ***their calf has been proven non-PI*** by a negative immunohistochemistry skin test.

Modified-live (MLV) or killed IBR/BVD virus vaccines can be used in vaccination programs. The current recommendations of veterinary virologists on the most effective use of vaccines in prevention of IBR and BVD virus infections is to *use MLV vaccines as much as possible* in a herd vaccination program. MLV vaccines provide more complete protection against infection of the fetus than killed vaccines. Careful though: **non-immune pregnant cattle that are vaccinated with MLV IBR/BVD vaccines will abort their fetuses from vaccine virus.**

An approach that safely utilizes MLV vaccines is to administer them to replacement heifers at weaning and then give a booster of MLV vaccine to the heifers 1 month prior to the onset of breeding. Thereafter, as adults they should receive MLV vaccine 3 to 4 weeks prior to breeding when they are not pregnant. There are some recent developments in the available MLV vaccines and their use that allows the more practical time of booster administration to be pregnancy examinations. This should only be practiced under close veterinary supervision with close adherence to vaccine insert recommendations.

## Trichomoniasis

*The Disease* - Trichomoniasis is a protozoan disease that like vibriosis is a venereal disease of cattle characterized by embryonic deaths which appear clinically as repeat breeders and low pregnancy rates. Abortions also occur beginning in early pregnancy and continuing right up to the time of calving. Trichomoniasis is probably one of the most economically devastating disease of cattle, second only to foot and mouth disease!

*Control Program* **–** Trichomoniasis is common in Texas beef cattle herds, but it is not as widespread as vibriosis and expensive vaccines are only partly effective. Most herds should use **biosecurity as the main control measure for this disease**. Don't buy trichomoniasis into the herd! All purchased **non-virgin bulls** must be cultured or tested by PCR for *T. fetus.* In addition, don't expose cows to bulls from other herds:

1) Don't borrow or lease bulls.
2) Don't graze common lands with other herds.
3) Keep your fences in good repair to keep the neighbor's cattle out.

Another defense against establishment of trichomoniasis into a herd is to *keep the bull battery as young as possible*. Younger bulls (less than 5 years) have shallower epithelial crypts in the mucosa of the prepuce than older bulls. The *T. foetus* organisms require deep epithelial crypts to establish chronic infection.

**Vaccination** of cows and bulls against *T. foetus* in a beef herd is **recommended under certain circumstances:**

1) High-risk herds (eg. neighbor's herd is infected, communal grazing).
2) In suspected trichomoniasis herds.
3) As part of the control program in trichomonas-infected herds.

## Neosporosis

*The Disease – Abortions* at any stage of gestation, but most commonly between 5 and 6 months is the main damage caused by infection of cattle with the protozoan *Neospora caninum. Stillbirths* also occur. This disease is *widespread in Texas beef herds* and is probably *one of the most common causes of abortion* in our beef cattle. A survey of calves in 2000 found that 59% of the herds that sent calves to the Texas Ranch to Rail Program were infected with *N. caninum*.

Neosporosis is a "new disease" of cattle, first reported in 1989 as the cause of an outbreak of abortions on a New Mexico dairy. Researchers later uncovered genetic evidence that indicates that this organism has been present on earth as long as cattle! The reason we did not recognize this disease until years after we had the technology to do so is that the organisms are mainly present in the brain of aborted fetuses and until recently, veterinarians conducting autopsies of aborted fetuses usually did not remove the brain!

This protozoan organism has a life cycle that involves dogs (coyotes, dingoes?) and foxes as definitive hosts and cattle as intermediate hosts. In Australia, the ranchers call this "wild dog disease". Dogs infected with *N. caninum* have been shown to shed *N. caninum* oocysts in their feces. Cows can become infected by ingesting the oocysts. Once a cow becomes infected, she is a *life-long carrier* of the disease. She also will almost always (85 to 95%) pass the infection to her calf in-utero. Most calves infected in-utero are normal healthy carrier calves who have a much *greater chance of aborting their first and second pregnancies than non-infected calves*. Thus, there are two possible ways that cattle can become infected with this protozoan:

1) Ingestion of oocysts in feed or water contaminated by feces of dogs or foxes that have neosporosis. Ingestion of placentas or fluids of aborted fetuses. (*Post-natal* or *horizontal* transmission)

2) In-utero infection of a fetus whose dam is a life-long carrier. (*Congenital* or *vertical* transmission)

In infected beef herds, *both* of these routes of transmission probably are ongoing to some extent. As has been proven in dairies, however, in-utero transmission is probably by far the most common means of transmission.

Replacement heifers or cows that are carriers of *N. caninum* are more likely to abort their fetus than those who are not infected. In an investigation of abortions in a Texas purebred herd, the author found that cows who were carriers of *N. caninum* were 10 times as likely to lose their calf as cows who were not carriers.

*Control Program* – Control programs at this early stage of our understanding of such a new disease are not well-proven. Much research is being performed on this

disease and successful control strategies will evolve as new information becomes available. Various combinations of biosecurity, testing and culling of carrier cows and vaccination are being tested. Research by Dr. Barling of our College of Veterinary Medicine has identified some of the management factors that are associated with a higher likelihood of a beef herd in Texas having neosporosis. These include a spring calving season or split calving season, a higher stocking density, use of round bale hay feeders and allowing wildlife access to the weaning supplement. A very interesting finding of his study was that beef herds in Texas who had a cattle dog were less likely to have neosporosis. Our cattle dogs must be having success at keeping wild canids away from cattle feed sources! Only one vaccine, (*NeoGuard*™ - Intervet Inc) is commercially available against *N. caninum*. Unfortunately, we do not know if it is effective. There have been no published independent studies on its efficacy. Carrier cows can be accurately identified by detection of antibodies in their serum. Use of the vaccine in a herd may make a test and cull program impossible because vaccinated cattle may remain seropositive for long periods of time. The role of vaccination in control of neosporosis will not be known until properly conducted field trials are performed on its ability to protect against abortion due to *N. caninum.*

**Biosecurity** appears to be the **soundest approach to control** of neosporosis with our current knowledge of the disease:

1) Test for antibodies in the serum of female potential herd additions. Only purchase seronegative females.
2) Lower the number of neospora carrier cows in the herd (they create more neospora positive females and they are more likely to abort than a neospora negative cow). Two approaches:
    a. Test the entire herd of breeding females and do not keep the offspring of infected cows as replacement heifers. It's highly likely they are infected! (This is the most economical control program for a commercial beef cow/calf herd)

    ***Or***

    b. Test the entire herd of breeding females, cull all positive cows and replace them with cows that have been tested negative. (This option is probably the best one for a purebred herd using embryo transfers into recipient cows because the value of the fetus is too high to risk losing. ***There is no need to cull donor cows, their embryos are safe to use***.)
3) Protect feed and water sources from fecal contamination of wild canids.
4) Promptly dispose of aborted fetuses and their placentas.

The author has found testing and culling cows to be very effective in controlling abortions due to *N. caninum* in a purebred beef herd in central Texas for 4 years after initiation of the program. Simulation models have recently concluded, however, that the most economically effective approach to control of neosporosis in a beef herd is to test all females and keep infected cows in the herd, but not use their daughters as replacements. *It is very important to accompany a test and cull program with an effort to reduce the number of potential wildlife carriers on the ranch.* When a vaccine is available that is proven to be effective, vaccination will become an important part of a neospora control program.

## Conclusions

Reproductive tract pathogens pose a great threat to the production and profitability of beef cow/calf operations. **They usually enter a herd through purchase of a chronically infected carrier** heifer, cow or bull and cause the most damage the first year they are introduced into a naïve herd. Replacement heifers and first-calf heifers are very susceptible to infectious diseases and experience the greatest loses from reproductive tract infections. Thus, it's wise to make special efforts to implement an effective reproductive diseases control program in a herd's young breeding stock. **Control programs for infectious reproductive diseases generally utilize a combination of biosecurity and vaccination, and should be closely supervised by the herd's veterinarian.**