Vet Call

► by **Bob Larson,** *DVM, University of Missouri-Columbia*

Vaccination strategies to reduce pregnancy loss

The first step in designing a program to minimize pregnancy wastage (infertility, abortions and stillbirths) is to select the diseases against which the herd should be immunized.

PHOTO BY LISA KLOENTRUP

Protection from pregnancy wastage in beef cattle has been enhanced by the development and improvement of vaccines against several important organisms causing embryonic loss and abortion.

Vaccine selection

Commercial vaccines are not available for all pregnancy-wasting diseases. Other diseases have vaccines manufactured for their control, but the vaccines may not be adequately effective or a primary concern for a particular area or herd. For most beef herds the potential list of diseases to include in a vaccination program would include brucellosis (Bang's disease), vibriosis (campylobacteriosis), leptospirosis (lepto), infectious bovine rhinotracheitis (IBR) and bovine viral diarrhea (BVD).

Other diseases for which vaccines are available include neosporosis, anaplasmosis, *Haemophilus somnus* and trichomoniasis (trich). When selecting diseases to protect against in a vaccination program, it is wasteful and unjustified to vaccinate with every available vaccine. The diseases selected should be limited to those for which there are effective vaccines and to which the herd will possibly be exposed. This decision is largely based on the classification of the herd as a closed, modified-open or open herd.

A closed herd has no new additions except for bulls, and there is no animal-to-animal contact with neighboring herds. New bulls are isolated prior to introduction into the herd, where they are appropriately tested for and vaccinated against contagious diseases during the isolation period. The level of immunization necessary for a closed herd is less than that for other herds because the risk of exposure is very low.

Modified-open herds have a higher risk of exposure to pregnancy-wasting diseases through limited additions of bulls and replacement females, animals moving in and out of the herd to exhibitions, or through contact with neighboring herds.

Open herds have a very high risk of exposure to pregnancy-wasting pathogens. This exposure may be due to the frequent introduction of replacements or exposure of the breeding herd to stocker cattle or other recently purchased, stressed cattle.

Brucellosis

Since brucellosis is a disease that can be spread to humans, its control in animals is especially important. *Brucella abortis* strain RB51 vaccine is a live bacterial product and confers long-term cell-mediated protection in healthy animals vaccinated properly and produces fewer false-positive blood tests in vaccinated cattle than the older, strain 19 vaccine.

Official calfhood vaccination of females between 4 and 12 months of age (some state requirements vary) is undertaken by accredited veterinarians or state or federal animal health representatives only. Whole-herd (adult) vaccination can only be undertaken under specific situations with approval from a state or federal animal health official.

Brucellosis is also controlled by a monitoring system of blood testing and identifying market cattle, cattle at livestock sales and cattle moving across state lines. Positive test reactors and the herds in contact with positive reactors are handled by rules developed by the U.S. Department of Agriculture (USDA). For most areas of the country, brucellosis has been eradicated, and many herds are no longer utilizing official calfhood vaccination. Whether or not to continue with a brucellosis vaccination program should be determined only after considering interstate movement, risk of exposure and legal responsibility.

IBR and BVD

IBR is a herpes virus infection and is easily transmitted by secretions from the respiratory tract, the eyes and the reproductive system. Like other herpes viruses, IBR viruses often cause hidden infections. The carriers that do not appear sick are important sources of exposure.

The BVD virus is widely distributed and is easily spread from one animal to another. Infection with BVD causes different reproductive losses, depending on the time a susceptible female is exposed to the virus. Abortion losses to BVD are sporadic, and the rate is usually low. Frequently, BVD is found in fetuses aborted due to other agents, such as fungal organisms, because BVD may suppress a

CONTINUED ON PAGE 216

CONTINUED FROM PAGE 215

herd's immunity and increase susceptibility to other infections.

To decrease the risk of pregnancy wastage from these viral diseases, nonpregnant heifers should be given modified-live vaccines (MLV) two or more times from weaning to 6 weeks before breeding. Although modified-live IBR/BVD vaccines do not require a booster to induce a protective response, it is recommended that vaccinations be repeated two or more times. Repeated vaccination is needed because one does not know when maternal antibody interference with active immunization wanes or if nutritional or host factors interfering with immunization are present. Multiple vaccinations allow the maximum number of heifers to develop active immunity to the vaccination. An open herd with a high level of risk may benefit from having annual IBR/BVD booster immunizations.

Veterinarians and immunologists have not been able to agree on the superiority of modified-live BVD vaccines vs. killed BVD vaccines for immunization of heifers. But, all veterinarians agree that because of the complexity of BVD infection and disease, a well-thought-out plan that includes screening for persistently infected (PI) individuals, herd biosecurity and vaccination is necessary to protect against this persistently troublesome virus.

Leptospirosis

This bacterial disease causes pregnancy wastage primarily in the last trimester of gestation of cattle, as well as infertility in the first trimester. Leptospiral organisms cause infection in the kidneys and are excreted in urine. Leptospires survive in wet environments for up to 30 days. Infection of susceptible cattle occurs through mucous membranes and abraded or water-softened skin, or by sexual contact. There are more than 180 serovars of leptospira.

Each serovar is adapted to a particular species of animal, which it uses as a maintenance host. In the United States, serovar hardjo has a maintenance host relationship with cattle. A maintenance host relationship is characterized by high susceptibility to infection, easy transmission within the host species, relatively mild disease in a host, a tendency to cause long-term rather than sudden disease and poor effectiveness of vaccination for prevention. Infertility may follow localization of leptospires in the uterus and oviduct of maintenance host hardjo carriers. A newly available vaccination against hardjo infection in cattle appears to prevent kidney establishment, urinary shedding and fetal infection.

By contrast, an incidental host relationship is characterized by relatively low susceptibility to infection, with a tendency to cause acute, severe disease. One also finds sporadic transmission within the incidental host species and good efficacy of vaccination for preventing infection. Serovar pomona is a common incidental pathogen of cattle, and the maintenance host is swine. Leptospira strains maintained by nondomestic animals such as skunks, raccoons, opossums, foxes, beavers, mice, deer and others can infect cattle herds that are exposed to environments such as urine-contaminated waterholes.

To establish immunity against the organism, primary immunization of heifers should consist of two or three vaccinations given at monthly intervals prebreeding, and another booster in midgestation of the first pregnancy. Annual or biannual boosters, at prebreeding and midgestation, should be given.

Methods other than vaccinations for reducing risk of exposure to leptospirosis should also be implemented. Options include having a closed herd and fencing cattle away from water sources that can be contaminated by other herds, swine or nondomestic animals.

Vibriosis

Campylobacter fetus subspecies *venerealis* is a disease passed during the act of mating. Infection of the uterus and oviducts can persist for up to two months, but thereafter the organism is progressively eliminated.

Management factors that minimize risk include utilizing artificial insemination (AI) with semen from noninfected bulls; utilizing bulls less than 3 years of age, since they tend to be difficult to infect when exposed to the organism; treating or culling infected females; and initiating an immunization program.

Protection of a herd from vibriosis by vaccination has proven to be effective. To induce an immune response to vibriosis, heifers should be vaccinated two or three times at one-month intervals after they are 6 months of age for the primary immunization. If risk of exposure to carrier males or females is present, annual vaccinations should be used to booster immunity.

Anaplasmosis

Abortion following maternal infection with anaplasmosis is an indirect result of poor oxygen transport to the fetus. The organism is transmitted by blood-carrying vectors such as ticks, blood-sucking flies, mosquitoes and surgical instruments. Control of the disease is dependent on controlling blood-sucking insects,

eliminating carrier animals from the herd by test and cull, treatment with tetracycline antibiotics, and, in some cases, utilizing vaccines.

Killed vaccines, which provide a low level of resistance to anaplasmosis, are available on an experimental basis. A vaccinated animal is still capable of becoming infected with anaplasmosis and becoming a carrier, but should be protected from symptoms, including abortion. A reaction causing a calf to destroy its own red blood cells has occurred in calves suckling cows vaccinated with previously available vaccines, so risk assessment should determine the benefits vs. the risks involved.

Haemophilus somnus

Haemophilus somnus can cause male and female infertility, and, only rarely, abortion. Transmission for the abortion syndrome is uncertain, but is most likely by mouth. Data showing the ability of vaccination to protect against abortion is lacking. Like most bacterial vaccines, protection from clinical disease is short-lived at best; therefore, a minimum of two initial vaccinations given at one-month intervals and at least annual boosters would be needed to provide even theoretical protection in those herds where the disease has been demonstrated.

Trichomoniasis

Trichomoniasis is caused by a protozoa organism (not a bacteria or virus). The organism is passed from one animal to the other during the act of mating. In cows, the parasite is confined to the reproductive tract. Trichomonads damage host tissue, cause inflammation of the uterus and invade placental and fetal tissue, resulting in early embryonic death. After a variable period of infertility, cows are usually able to clear the infection (although PI females have been reported). On subsequent exposure to infected bulls, cows appear to be less susceptible to infection.

In bulls, trichomoniasis does not have any symptoms. The organisms are located on the surfaces of the penis and penile sheath, where they cause little damage. Most bulls less than 4 years of age appear to recover spontaneously or to resist infection.

Control of trichomoniasis outbreaks involves management practices such as using AI, using bulls less than 4 years of age, culling females that do not conceive in a short breeding season, and continuing surveillance of the herd by culturing bulls and culling carriers. Vaccination programs for females exposed to trichomoniasis-infected bulls appear to be beneficial in controlling outbreaks. The program should include two vaccinations four weeks apart for the initial vaccination and annual boosters thereafter. Researchers have shown that, although an immunization program did not completely prevent trichomoniasis, it did decrease the number of cows infected and decreased the length of time it took for infected cows to clear the organism.

Vaccination programs should not be the cornerstone for a herd health program, but rather a part of a sound management program.

Preventing the introduction of trichomoniasis into a herd in areas where the disease is common includes eliminating common pastures and identifying carriers by examination of samples taken from the penile sheath from bulls three times at weekly intervals before the start of the breeding season.

Neospora caninum

A vaccine has been licensed for use in the United States to aid in the control of abortion due to neospora, but field trials demonstrating its ability to decrease the risk of infection or abortion are not available. In addition, use of the vaccine may complicate or eliminate the ability to utilize a test-and-cull strategy, because veterinarians may not be able to tell the difference between antibody responses caused by natural infection and vaccination.

Manage herd health

Protection from pregnancy wastage in beef cattle has been enhanced by the development and improvement of vaccines against several important organisms causing embryonic loss and abortion. In order to obtain benefit from these vaccines, their use must follow the principles of immunology, and they must be combined with sound management practices that control risk.

Because of the limited number of diseases for which vaccines are available and the inability of vaccines to provide immunity in the presence of nutritional deficiencies, immunosuppression, and other management problems, vaccination programs should not be the cornerstone for a herd health program, but rather a part of a sound management program.

E-MAIL: larsonr@missouri.edu