Extension
UNIVERSITY OF WISCONSIN-MADISON

Vaccination to Improve Reproductive Health in Wisconsin Cow-Calf Herds

Reproductive diseases of concern for Wisconsin's cow-calf herds include those caused by bacteria, protozoa, and viruses. This factsheet discusses *Brucella*, *Leptospira*, and Campylobacter (*Vibrio*) bacteria; *Trichomonas* and *Neospora* protozoa; and BVD and IBR viruses. All except *Neospora* have vaccines available. Current *Trichomonas* vaccines do not protect bulls.

Reproductive diseases caused by bacteria

Brucellosis and leptospirosis are bacterial diseases found worldwide. Both are zoonotic, meaning they can make people sick.

Vaccine Types and Immune Response

The bovine immune system has two components, humoral and cell-mediated. The humoral component produces antibodies that are measured as a titer. The cell-mediated component fights the pathogen in a variety of ways.

Killed virus (KV) vaccines stimulate the humoral component; antibodies and some memory B cells are produced. KV does not replicate after it's injected and therefore does not stimulate cell-mediated immunity.

Modified live virus (MLV) vaccines contain dehydrated virus in a pellet that is reactivated once reconstituted. When injected, they replicate for a short time. This mild infection stimulates both humoral and cell-mediated components. MLV titers are higher and remain elevated for longer periods than KV titers.

Even though MLV can produce long-lasting titers, it is still important to boost the primary dose. On any given day, for various reasons, 15% those vaccinated simply do not respond as well as the rest. The booster is very important to achieve uniform herd immunity.

Brucella may cause abortion storms of unvaccinated cows and heifers during their fifth to sixth month of gestation; retained placenta and metritis (uterine inflammation and discharge) occur. In bulls, it causes infertility and potentially orchitis, epididymitis, scrotal swelling, and necrosis of the testes.

The National Brucellosis Eradication Program has eliminated brucellosis from most US and Wisconsin. States bordering Mexico and the Yellowstone National Park have an increased risk for *Brucella* exposure. Be wary of purchasing cattle from these areas.

Interstate travel requires brucellosis testing. Most states (including Wisconsin) prefer that imported cattle be vaccinated. Only federally accredited veterinarians can administer the *Brucella* vaccine and apply the official orange ear tag. You may have experience vaccinating seed stock for sale to other states beyond Wisconsin.

While *Brucella* is not common in Wisconsin, *Leptospira* is. Harbored (endemic) in white-tailed deer and mice, *Leptospira* species (and 200+ serovars) infect and colonize kidneys and pass in urine. *Leptospira* survives in cool, standing water or ponds and mud for long periods. Flooding helps spread the organism. It does not survive freezing in winter and desiccates in hot dry summers. Animal and human inoculation occurs from infected water splashing onto the skin, face, or mouth.

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Adverse Reactions

MLV vaccination may cause actual disease in stressed or unhealthy animals. The controlled mild disease created is not a threat to healthy animals.

Side effects of all vaccines include post-vaccination fevers or abortion. Post-vaccination fever is a normal expected immune response. Fever contributes to abortion in stressed pregnant animals or those incubating concurrent disease.

Adverse reactions may occur with every product you choose. READ AND FOLLOW THE LABEL. Animals should be in a proper plane of nutrition and not under stress when vaccinated. Work with your veterinarian to establish vaccination protocols for your farm.

L. hardjo-bovis is host-adapted, infecting cattle of any age. Kidney colonization and an associated low antibody titer reduce the ability of cattle to clear the organism. Carrier (reservoir) cattle are the major source of infection in the herd. Host-adapted leptospirosis produces reproductive failure and returns to service.

L. bratislava, canicola, icterohaemorrhagiae, grippotyphosa, and *pomona* are host-adapted to other species (wildlife and rodents). Cattle are incidental hosts to these infections which cause kidney disease and abortion. Surviving cattle's high antibody titers reduce urinary transmission for short periods but despite high titers, reinfection is likely.

Young calves or calves infected at birth develop a mild renal disease known as 'red water' because of the bloody urine produced. Infected calves often become reservoirs for the herd.

Commercial vaccines available in the US include 5-way killed products for *L. pomona, canicola, icterohaemorrhagiae, grippotyphosa, and hardjo* that create humoral immunity (produce antibodies). These vaccines give good protection against all *Leptospira* except *hardjo-bovis.* The *hardjo* in these products is *L. interrogans* serovar *hardjo*, which is present in Europe, and not commonly found in the US. Using it does not prevent renal infection, urinary shedding, or fetal infection from the US serovar.

Protecting the Fetus

The cow or heifer's vaccine titer must block the placental transfer of the offensive agent. It takes multiple doses to achieve fetal protection using killed vaccines and most won't claim fetal protection on their label.

Leptospirosis is often diagnosed following third-trimester abortions. The 5-way vaccines (L5) will prevent these abortion scenarios. Despite their label claim, killed L5 vaccines do not produce antibody titers lasting a full year. Booster every six months to provide yearlong protection.

L. hardjo-bovis products containing the U.S. serovar are available. They are not referred to as 'killed' but rely on different technologies that create both humoral and cell-mediated immunity. A full year's immunity is achieved with these vaccines, and they are licensed to prevent renal and fetal infection. These are available as stand-alone vaccines or incorporated into L5 combo products. Talk to your veterinarian and read the label to understand the product's efficacy and duration of immunity.

Vaccinate pre-breeding so increased immunity to *Leptospira* coincides with conception and embryo development. Booster at pregnancy check (two to four months post-breeding) to protect against abortion and newborn calf infection.

Do you need to add *L. hardjo-bovis* vaccines to your protocol? This depends on your herd level of *hardjo-bovis*. Herd serology gives a better diagnosis than testing individual cows or individual abortion cases. Considering the economics of herd serology, vaccination is probably cheaper and usually warranted. Keep records and suspect sub-clinical leptospirosis if you have early embryonic deaths (EED), repeated breeding, or long calving intervals. Adding *L. hardjo-bovis* vaccine may increase your herd's reproductive efficiency by 2 - 3%.

Campylobacter were considered *Vibrio* organisms until the 1970s when they were reclassified to *Campylobacter*. A sexually transmitted disease (STD), carrier cows and bulls harbor this organism in the vaginal mucosa, penis, and prepuce. Infected bulls contaminate their bedding during urination,

which exposes other bulls to infection. Bulls transmit the organism from female to female and this is the only way females are infected. There are no signs of infection in the bull.

Practice Biosecurity

'Biosecurity' means keeping your animals secure from biological threats. Proper nutrition compliments biosecurity. Minerals are important to support the immune system as is avoiding stress and minimizing parasite burdens. Parasites steal nutrients and are a source of chronic inflammation.

Isolate newly acquired animals from your herd for at least ten days; for many diseases, 30– to 60-day isolation is preferred. Consult your veterinarian to determine isolation time for your situation. Isolation means eliminating nose-to-nose contact, not sharing bunk or water sources or animal handling equipment. Make sure new animals' vaccination history matches that of your herd.

Diseases are also transferred from one farm to another by rodents, wildlife, birds, pets, and vehicles. Humans move disease agents on their hands, clothes, and shoes. Work with your veterinarian to maintain a biosecurity plan for your farm.

Campylobacter causes endometritis (inflammation of the uterine lining), which harms the developing embryo. Initial infection may not interfere with conception but causes EED and return to estrus 40 - 60 days after breeding. A prolonged calving season and reduced calf crop may indicate campylobacteriosis.

Infected females eventually clear the infection so that pregnancy may be established, but this resistance is temporary, and reinfection is possible three to four months later. Others may never maintain a pregnancy. Still others, even though infected, can deliver a normal calf. All these females can serve as silent carriers to infect susceptible bulls and overall herd fertility never returns to its normal uninfected level. *Campylobacter* causes abortion during the fourth to seventh month of gestation.

Campylobacter (Vibrio) killed vaccines are available. Although not labeled for bulls, research has shown vaccination can cure the bull. Talk to your veterinarian about vaccinating bulls.

Vaccination alone is not the sole measure for controlling campylobacteriosis. Practice bull biosecurity by purchasing older bulls that test negative for this organism and be wary of rented or loaned bulls. Using virgin bulls for one breeding season virtually prevents *Campylobacter* establishment in the herd.

Reproductive diseases caused by protozoa

Trichomoniasis is another STD. *Trichomonas foetus* localizes in the bull's smegma (secretions) lining the penis, prepuce, and urethra. It does not create lesions, nor affect semen or sexual behavior, and the bull does not appear sick. It typically infects older bulls that become permanent carriers. Bulls less than four years old are thought to either recover spontaneously or are refractory to *Trichomonas*. Once infected, bulls are unable to develop immunity.

The organism colonizes the vagina, uterus, and oviducts of cows. While not preventing conception, vaginitis (inflammation of the vagina) and endometritis occur one to two months post-infection. EED and return to estrus occur, creating a prolonged calving season and reduced calf crop. Cows generally rid themselves of the disease after 60 - 90 days of sexual rest.

There are no effective treatments for trichomoniasis, and it is often introduced to the herd by infected bulls. All purchased non-virgin bulls should be tested for *Trichomonas*.

Vaccinate high-risk cows or those diagnosed with trichomoniasis. Vaccines are labeled for cows only; there is no label claim for efficacy in a bull.

Neospora caninum is another protozoon commonly found in Wisconsin. Dogs, coyotes, wolves, raccoons, and mink are definitive hosts, which means the protozoan larvae reach sexual maturity in these animals, and eggs are passed in their feces. The animal does not appear to be sick.

Cattle are incidental hosts of *Neospora*. Eggs ingested from the feces of an infected animal hatch in cattle intestines and infective asexual tachyzoites are released. The cow will not appear sick. Tachyzoites cross the placenta and harm the fetus.

Infections during the third month of gestation result in mummified calves. Abortion occurs at any stage of gestation. *Neospora* causes both endemic and epidemic abortion patterns. Endemic herds have slightly greater than 5% elevated abortion rates that persist for years. Less common epidemic herds suffer abortion storms where the abortion rate is greater than 30% over several months.

Cows that abort once are likely to abort again. Calves infected in-utero (congenital infection) are born clinically normal and have an 80 - 90% chance of being persistently infected. Congenitally infected heifer calves can transmit the infection to the next generation when they are pregnant.

Neospora-infected cattle do not produce eggs and do not transmit their infection to other cattle, but *Neospora* larvae survive in tissue. Properly dispose of dead cattle, aborted fetuses, and placentas so that dogs and other wildlife cannot ingest them. Prevent farm dogs and other wildlife from defecating in feed and water that cattle consume.

Submit aborted calves for diagnosis and include testing for *Neospora*. Test farm dogs. There is no treatment and no vaccination available for *Neospora*. Control rests with herd biosecurity. Focus on reducing the number of *Neospora*-infected cows in the herd and limit the introduction of infected replacement cattle by testing all breeding females. Do not breed those positive for *Neospora*.

Reproductive diseases caused by viruses

Bovine Viral Diarrhea (BVD) is found in cattle everywhere. Frequently undiagnosed, BVD is the viral infection that impacts beef operations the most financially. It is easy to transmit, has a variable incubation period, and causes profound immunosuppression, making cattle susceptible to other diseases. Exposure to BVD causes presently high antibody levels that complicate diagnosis.

BVD symptoms include fever, diarrhea, and erosions of the mucous membranes in the gastrointestinal tract. BVD often goes unnoticed unless oral erosions are observed.

BVD is often the cause of undifferentiated respiratory disease because fever, nasal discharge, and rapid breathing are the predominant symptoms. The greatest economic consequence of BVD, however, is due to the reproductive diseases it causes.

Cattle are primary reservoirs of BVD, and persistently infected cattle maintain the virus in the herd. A variety of fetal abnormalities occur depending on the stage of gestation during which the cow is infected.

Vaccinating dams against BVD does not protect the fetus. Label claims of 'fetal protection' does not mean the fetus is mounting an immune response to the vaccine. Vaccination increases circulating antibodies that neutralize BVD before it crosses the placenta. High titers can be created with multiple doses of killed or MLV vaccines per year.

Do not rely on vaccination alone to protect your herd from BVD. Herd biosecurity is necessary: purchase cattle, including the bull, who test negative for BVD. Screen your herd and test calves to cull persistently infected animals as soon as possible. All persistently infected cattle and calves should be euthanized.

Infectious Bovine Rhinotracheitis (IBR) is also found everywhere in cattle populations. Abortions happen months after respiratory IBR passes through the herd.

Clinical symptoms of IBR include high fever, loss of appetite, rapid respiration, dyspnea (open-mouth breathing), and profuse nasal discharge. IBR is

All health products have use and storage directions printed on the label.

Vaccines have withdrawal times. Keep records to avoid violative residues at slaughter. Do not use expired vaccines. Monitor refrigerator temperature to ensure vaccines are stored correctly. 'Use Entire Bottle' label directions require using the entire bottle once opened. Live and MLV must be used immediately when mixed; as you are vaccinating a group of animals, mix the bottles as you go, keeping them cool and out of sunlight as you work. Needles are single service items. Select the proper needle size based on the viscosity of the product being used and the size of the animal being injected.

commonly called 'red nose' because of inflammation of the nostrils and muzzle. IBR-induced conjunctivitis may be misdiagnosed as pinkeye.

VCPR

Licensed cattle veterinarians have current knowledge and information regarding the prevention and treatment of diseases that may harm your herd. A veterinary-client-patient relationship (VCPR) establishes a veterinarian's knowledge about your animals and your management practices and helps to prevent drug residues. The Food and Drug Administration (FDA) requires a valid VCPR for prescription or extra-label drug use (ELDU. Most vaccines are available over the counter and your veterinarian is the best resource for using them correctly.

Prior infection can become dormant (latent) and can trigger IBR breaks when the animal is under stress. Vaccinate to produce disease-blocking antibodies before known periods of stress. Vaccinate pre-breeding to protect the developing fetus by increasing antibody titers to neutralize the IBR virus before it crosses the placenta.

Abortion follows IBR respiratory disease or conjunctivitis. Most fetuses are aborted during the last four months of gestation. The fetus may be expelled right away, or as much as 100 days later. Fetuses are dead in utero for several days before expulsion and are often too decomposed for adequate diagnoses. The dam's serology may be more diagnostic.

IBR causes inflammation of the ovary which interferes with hormone production necessary to maintain pregnancy. Early embryonic death results when cows are exposed to IBR at breeding. Vaccines containing MLV IBR also cause ovarian inflammation, arresting follicular development necessary to maintain pregnancy. The presence of MLV IBR in naïve animals will prevent failure of conception when these cattle are concurrently bred. Wait 30 days after vaccinating with MLV to breed these animals. Once vaccinated, the animal's immune memory is primed, and these effects on the ovary are no longer seen; subsequently, this 30-day rule will no longer apply.

Injecting nursing calves with MLV IBR normally causes a mild infection (which is how immunity is obtained) and these calves may expose un-primed cows to IBR. The IBR may prevent her next pregnancy or cause her to abort an early pregnancy. Always read the label! It will tell you if the vaccine is safe for or around pregnant animals. MLV IBR is very safe when used correctly.

Nearly every respiratory vaccine product available includes IBR. Intranasal (both killed and temperature sensitive) vaccines stimulate nonspecific interferon to protect against IBR respiratory disease. Intranasal products do not produce circulating antibodies to protect a developing fetus.

In summary

All Wisconsin cow-calf herds (including herd bulls) should be vaccinated for *Leptospira*, BVD, and IBR. You may choose to vaccinate for brucellosis, especially if selling cattle outside of Wisconsin. Discuss *Campylobacter* and *Trichomonas* testing and vaccination with your veterinarian. Work with your veterinarian to establish effective biosecurity, testing, and vaccination protocols. Set your vaccination protocol to the farm's schedule. Vaccines are unlikely to be administered when the protocol is too difficult to follow.

Have facilities in place so you can conveniently handle your herd. You have several opportunities to vaccinate cows, calves, replacement heifers, and bulls, including chute events for pre-breeding exams, pregnancy checks, and pre-weaning calf vaccinations. Pregnancy exams at 45 - 60 days post-breeding provide vital information about the herd's reproduction. Pre-weaning vaccinations prime the calf for successful weaning and future reproductive performance as well as provide an opportunity for booster shots to the dam or bull.

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