



University of Wisconsin-Extension

Vaccination to Improve Calf Health in Wisconsin Beef Cattle Herds

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Vaccines are created from viral or bacterial components. The immune system sees killed or chemically inactivated microbes as antigenic protein. The humoral component of the acquired immune system responds producing antibody and some memory B cells.

Live and modified live vaccines (MLV) are alive, dehydrated in a pellet and reactivated once reconstituted. When injected, they replicate for a short period of time. This mild infection stimulates both humoral and cell-mediated components of the immune system. The amount of antibody initially produced is higher and remains elevated for longer periods of time than that produced by killed vaccine.

Multiple doses of killed vaccine generate the same titer level one dose MLV creates. Even though MLV can produce high, long lasting titers, it is still important to booster the primary dose. On any given day, for various reasons, 15% of the vaccinated population simply does not respond as well as the rest, so the booster is very important to achieve uniform herd immunity.

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Overall beef calf health is maintained by sound management programs which include vaccination strategies. Vaccination never replaces management. To begin with, calf health hinges on the nutritional plane the pregnant cow is on during the last 60 days of gestation. This is especially true for first calf heifers and for late gestation cattle during the coldest part of WI winter.

Make sure cows calve at a body condition score of five to seven, ideally seven. Both too thin and too fat sets the calf up for increased health related events including dystocia. Body condition should be evaluated and recorded three times a year: at weaning, 60-90 days before calving and at calving. Scoring 60-90 days before calving allows you to evaluate your feeding program while allowing enough time prior to calving for 'emergency feeding' if needed. As the fetus is also growing, it can be difficult to put weight on the cow, especially when the weather is cold or high quality feeds are limited.

Newborns must receive four quarts (one gallon) of good quality colostrum within the first 24 hours of life. Time to stand and time to nurse are traits correlated to bull genetics. Monitor calvings to make sure the calf is up and nursing soon after birth as colostrum quantity deteriorates every hour the calf is not nursing.

Calve in a clean environment, so the calf is not exposed to disease pathogens in the bedding nor from suckling dirty teats. Move recently calved cow/calf pairs to a clean, new location. Put similar age calves together and don't mix with calves that are 2-3 weeks older. As the calf ages it is exposed to pathogens which it may in turn give to younger, naïve and immature calves. Keeping groups small (10 to 25 pair)

until calves are a month old provides additional biosecurity.

To prevent naval ill and subsequent septicemia, newborn calf navels should be soaked in iodine or chlorohexidine immediately after birth. At this same time, vaccinations and other supplements may be given, along with placing identifying earmarks and testing for BVD.

If your herd has a history of neonatal diarrhea, you may wish to consider vaccinating late gestation cattle with products to boost the protective immunoglobulin the cow secretes into her colostrum. Anti-diarrhea vaccines include *E. coli* K99, Rotavirus, Coronavirus and *Clostridia perfringens*. Antibody concentration into the udder begins five weeks pre-fresh, with peak concentration deposited two weeks before calving; so vaccinations to boost colostrum immunity need to be injected 8 weeks pre fresh. Protection to the calf from these vaccines hinges on timely ingestion of colostrum.

It is possible to vaccinate the newborn calf with products to help prevent diarrhea from the agents mentioned above. These vaccines provide short-term, localized immunity to protect the calf during its first weeks of life. Some products are to be given orally prior to the ingestion of colostrum. Talk with your veterinarian and read the label of the product you are using so you use the product correctly.

Time vaccinations to match immune system capability

Calves are born with a functional, but naïve immune system. The onset of puberty (4-6 months of age) marks immune system maturation, with full immunity reached by 10-12 months

Adverse reactions can occur. . .

Live and MLV may cause actual disease in stressed or unhealthy animals. The controlled mild disease created is not a threat to healthy animals. Post vaccination fever is a normal expected immune response. Depressed appetite is a common symptom of fever. Stressed calves off feed from fever which are incubating concurrent disease may then break with that disease.

Adverse reactions may occur with every product you choose. **READ THE LABEL AND FOLLOW IT EXACTLY.** Make sure your animals are in a proper plane of nutrition and not under stress when vaccinated. Work with your veterinarian to establish vaccination protocols for your farm. Discuss with your veterinarian products to have on hand in case of an adverse reaction to vaccination.

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of age. From birth to four months, the calf is able to mount a limited immune response to vaccines, especially those given intranasal or orally. Systemic vaccines (given IM or SQ) are poorly responded to by the immature immune system and may actually be blocked by the presence of colostrum derived maternal antibody. Maternal antibody wanes by 4 months of age, at which time the calf can begin to respond to systemic products.

Studies demonstrate an age dependent immunity to bovine respiratory disease. Calf's maternal antibody protection to respiratory pathogens is gone by 12 weeks after birth. Begin respiratory vaccination at 8 – 12 weeks of age when your herd has a history of respiratory disease in calves 4-5 months of age.

Weaning is the next time calves are likely to develop respiratory disease. Respiratory disease at weaning can be mitigated with properly timed vaccines containing IBR, PI3, BVD and BRSV combinations. It takes time for the immune system to respond to vaccines, creating protective titer levels. You want protective circulating titer to be present during the weaning stress, so give the second booster vaccine at least two weeks prior to the weaning date.

Some respiratory agents also cause reproductive disease. Respiratory/reproductive vaccines given prior to weaning begin the vaccine history needed to prepare your herd replacements for a successful reproductive career. Calves' immunity between 5 – 12 months of age is not reproductively programmed. Fetal protection is not provided by reproductive vaccinations given to young calves. To achieve such duration, yearlings (10-12 months of age) must receive reproductive vaccination, or be boosted to those given earlier.

As Clell Bagley, DVM, Extension Veterinarian Utah state University states, "carefully consider those (vaccines) needed for your operation...the multiple brand names and combinations of products can be very confusing. This will be less of a problem if you decide what specific diseases or organisms you want to vaccinate for and then begin to select from the products available."

***Escherichia coli* is ubiquitous in cattle populations.** *E. coli* and its numerous strains are bacteria normally found in the intestinal tract of cattle passed in the feces to contaminate the

• Maintain natural immunity

- Proper nutrition: copper, selenium, zinc
- Avoid overcrowding
- Control internal and external parasites

• Keep infectious agents out of the herd

- Purchase from well-managed, reputable herds
- Test prior to purchase

• Minimize spread of infectious agents

- Quarantine upon arrival
- Identify and cull carrier animals
- Isolate sick animals, bury/compost dead animals
- Separate feed and manure handling equipment
- Reduce exposure to wildlife reservoirs

• Maintain acquired immunity

- vaccination protocols

environment. Whether or not *E. coli* causes disease depends on the virulence of the strain, the immune status of the calf (especially in relation to success or failure of passive transfer), stress, wet environment and poor diet. The enterotoxigenic strain *E. coli* K99 may cause diarrhea and sudden death in calves **less than three days of age**. Vaccines are available to be given to either late gestation cattle (Scourguard,

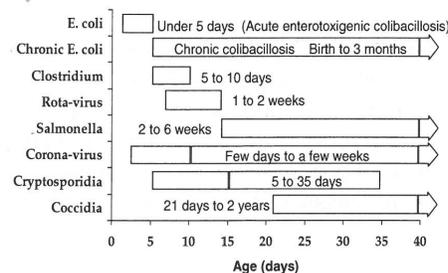
acute death or chronic disease. Chronic disease can occur for up to 2 weeks of age with localization of infection causing polyarthritis, meningitis and convulsions. Sanitizing navels immediately after birth protects the calf from *E. coli* septicemia, as does minimizing the manure meals a newborn calf ingests.

Clostridium perfringens Is an endospore forming bacterium which produces at least 12 different toxins and antigens and is divided and named into types A to E. Found in soil, these bacteria are ingested by cattle and can live normally in the gastrointestinal tract without causing disease. Well-fed calves from **one week to one month of age** may develop enterotoxemia when intestinal conditions favor the overgrowth of *C. perfringens* type A, C and B and the release of toxins. Symptoms include acute bloody diarrhea, intestinal bloat, abdominal pain, convulsions and sudden death.

Vaccines containing *C. perfringens* types are available to be given to both late gestation cows and newborn calves. Toxoid and Antitoxin products are also available. Talk with your veterinarian to understand how to use these products correctly.

Rotavirus and Coronavirus both infect the intestinal tract, destroying villi absorptive properties, causing a subsequent secretory diarrhea usually in **10 day old calves**. While not fatal in and of themselves, the resulting diarrhea and dehydration causes the calf to be

AGE DISTRIBUTION OF ENTERIC DISEASES IN CALVES



Scour Bos or Guardian) or orally to newborn calves (Ecolizer) to prevent *E. coli* K99 scours.

Vaccines are not as efficacious against the enteropathogenic strain of *E. coli* which causes a chronic, mucoid diarrhea in **older calves, 4 days to 3 months of age**. Infected calves do not gain well, are unthrifty and susceptible to other infections.

E. coli may also cause septicemia during the first week of life (typically 2 and 5 days of age) which can lead to per-

susceptible to concurrent disease. Intestinal acidosis may also result which causes the calf to lose its suckle reflex. The calf soon dehydrates and starves to death.

Vaccines given to late gestation cows often contain rotavirus vaccine (Scourguard, Scour-Bos or Guardian). Protection to the calf from vaccines given to cows hinges on timely ingestion of colostrum. It is also possible to vaccinate the calf at birth against Rotavirus and Coronavirus by administering oral Calf-Guard vaccine, a modified live product, before colostrum is ingested. Work with your veterinarian to understand how to use these products correctly.

Salmonella is another soil borne bacteria capable of causing high fever, septicemia, bloody diarrhea, septicemia and acute death in **calves older than 10 days of age**. *Salmonella* may also cause pneumonia. Cattle that appear to recover from *Salmonella* may harbor the organism, becoming a subclinical carrier and a disease threat to the herd.

Numerous vaccine products are available to protect cattle from *Salmonella*. If you suspect salmonellosis, it is most helpful to have the strain isolated by a lab so the correct vaccine product can be used.

Eimeria, Cryptosporidium and Giardia are protozoan parasites which cause diarrhea in calves older than 10 days of age. Vaccines are not available to prevent these infections. Treatments are available for *Eimeria* (coccidiosis) and *Giardia*. Preventing fecal contamination of feed and water is key to avoiding problems from these organisms.

Practicing biosecurity helps prevent disease introduction

'Biosecurity' means keeping your animals secure from all biological threats. This begins with maintaining a healthy animal with proper nutrition. 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, isolation is preferred for 30-60 days. Consult your veterinarian to determine isolation time for your situation. Isolation means no 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.

Infectious Bovine Rhinotracheitis (IBR) is ubiquitous in cattle populations. Clinical symptoms of IBR include high fever, inappetence, rapid respiration and dyspnea (open mouth breathing). Profuse nasal discharge occurs along with hyperemia of the nostrils and muzzle ("red nose"). IBR induced conjunctivitis may be misdiagnosed as pink eye; however, IBR corneal opacity occurs at the cornea-scleral junction (limbus), not centrally like with pinkeye.

Latent IBR infections in the Trigeminal Nerve can trigger IBR breaks when the animal is under stress. Vaccinate to produce disease blocking antibody before known periods of stress.

Pay attention to use of MLV vaccines containing IBR injected into nursing calves. The induced mild infection may shed IBR from these calves to unprimed cows. 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 pregnant animals. MLV IBR is very safe to use when used correctly.

Nearly every respiratory vaccine product available includes IBR. Intranasal (both killed and temperature sensitive) vaccines produce mild disease to stimulate more complete immune response including nonspecific interferon to protect against IBR respiratory disease.

Parainfluenza-3 (PI-3) virus is one of the most common viruses involved in the "shipping fever complex" occurring within onto to two weeks after calves arrive at feedyards. PI-3 is ubiquitous in cattle populations. Uncomplicated PI-3 infections are mild and the majority are asymptomatic. The economic importance of the virus lies in its ability to predispose cattle to bacterial

pneumonia. Respiratory disease is most likely to occur in calves that are stressed during marketing and transporting. Nearly every respiratory vaccine product available include PI-3.

Bovine Viral Diarrhea (BVD) is ubiquitous in cattle populations. Its easy transmission, frequent undiagnosed infection, variable incubation period and profound immunosuppression causes it to be the viral infection with the most economic impact.

BVD causes fever, diarrhea, erosions or necrosis of mucous membranes of the gastrointestinal tract. BVD often goes unnoticed unless oral erosions are observed.

BVD is frequently diagnosed as "undifferentiated respiratory disease" because fever, nasal discharge and rapid breathing are predominant symptoms. The greatest economic consequence of BVD is due to the reproductive diseases it causes. **The second greatest economic consequence of BVD is the sub-clinical carrier in your herd.**

Cattle are primary reservoirs of BVD and persistently infected cattle maintain virus in the herd. High protective tiers to BVD can be created with multiple doses of killed products or with one or two doses MLV per year.

Do not rely on vaccination alone to protect your herd from BVD. Herd biosecurity is necessary: purchase cattle, including the bull who have tested clear of BVD. Screen your breeding herd and test breeding stock as calves, to cull persistently infected animals as soon as possible. Persistently infected cattle may be diagnosed at birth by testing either blood or a sample of skin (ear notch). All persistently infected cattle and calves should be euthanized.

Bovine Respiratory Syncytial virus (BRSV) will infect cattle of all ages. Clinical symptoms include high fever, difficult breathing, and coughing. Most cases recover spontaneously, but complicated cases in stressed cattle often progress to death in spite of treatment, or result in permanent lung damage; unthrifty cattle result.

***Pasteurella multocida* and *Manheimia hemolytica* are two pneumonia causing bacteria and both can be treated with antibiotics.** Vaccines are available and should be considered following a lab diagnosis or if this is an endemic problem in your herd. Keep in mind that it is always more profitable to prevent infections than to treat. Pneumonia can be prevented by avoiding overcrowded, wet living conditions and providing optimal ventilation. Bacterial pneumonia always follows viral infection. Vaccinate with the viral vaccines prior to scheduled stress events.

Clostridia vaccines should be given as we prepare weaned calves for entry into the feedlot or into our reproductive herd. Initial doses are to be boosted per label, with annual revaccination required. Seven and eight way vaccine products are available which contain combinations of ***Clostridium chauvoei* (blackleg), *Cl. septicum* (malignant edema), *Cl. novyi* and/or *Cl. Sordellii* (2- or 4-way), *Cl. perfringens* types C and D (enterotoxemia, overeating). Check the label, *Cl. tetani* may or may not be included.**

Clostridium bacteria are found in almost all anaerobic soil, mud and gastrointestinal tracts of animals. *Clostridia* may cause death from the endotoxins produced under favorable conditions following inoculation into wounds or when the gastrointestinal tract supports their overgrowth. Different geological areas have varying prevalence.

Talk with your veterinarian to determine which *Clostridium* are problems in your area. Tetanus is not as severe

Bacteria

- *E. coli*
- *Salmonella*
- *Brucella*
- *Pasteurella/Manheimia*
- *Clostridium*

Viruses

- Rotavirus, Coronavirus
- IBR, PI3, BVD, BRSV

- ✓ VCPR
- ✓ Determine which diseases you need to protect your herd from
- ✓ Tailor vaccination protocols to cow's life cycle
- ✓ Pre-breeding
- ✓ Preg check
- ✓ Pre-weaning
- ✓ Bull

a problem in cattle as it is in goats, sheep and horses. Practicing open castration and dehorning techniques helps prevent *Clostridium* inoculation and in most cases vaccination against tetanus is not needed.

Vaccinating for *Brucella* is optional in Wisconsin as we are currently free of this disease. If you are selling breeding livestock interstate or internationally, then you would vaccinate for *Brucella*. This vaccine is administered by federally accredited veterinarians to calves between four and seven months of age.



This factsheet has discussed the common calf diseases in Wisconsin beef cattle. Work with your veterinarian to establish a vaccine protocol that makes sense for your calves. Refer to *Vaccination to Improve Reproductive Health in Wisconsin Beef Cattle Herds* (compiled by Stuttgen, 2013) for information regarding vaccinating your heifer and bull replacements against *Lep-tospira* and other reproductive diseases.

Remember your goals for vaccinating beef calves: to protect the calf against potential disease agents, to begin to provide protection for the calf's entry into the adult herd or into the feedlot and to increase or at least maintain the level of herd immunity.

Have facilities in place so you can conveniently handle your herd. You have several opportunities to vaccinate cows, calves and replacement heifers including 1) pre-breeding, 2) pregnancy check (exams at 45-60 days post-breeding provides time to diagnose reasons for not-pregnant and to re-breed) and 3) pre-weaning. Pre-weaning vaccinations prime the calf for successful weaning and future reproductive performance and also provide opportunity for booster shots to the dam. Don't forget to vaccinate the bull.

Set your vaccination protocol to the farm schedule you already have. Vaccines are unlikely to be administered when the protocol is too difficult follow.

All health products have use and storage directions printed on the label. Vaccines have withdrawal times. Keep records so you do not create 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 proper needle size based upon viscosity of product being used and the size of animal being injected.

The key to properly using vaccines rests with the relationship you have with your veterinarian. This relationship is a good investment for you to make. Veterinarians are the purveyor of current knowledge and information regarding the prevention and treatment of diseases of your cattle. A veterinary client patient relationship (VCPR) establishes a veterinarian's knowledge about your animals and your management practices. The VCPR helps to prevent drug residues. The Food and Drug Administration requires a valid VCPR before prescription or extra label drug use may be administered. Most vaccines are available over the counter, but some diseases are better controlled with an extra-label (ELDU) use of vaccines.