



Vaccinations for Beef Cattle: Best Practices and Considerations

A Guide for Beef Cattle Producers

Definitions:

Antibodies (or immunoglobulins): Proteins created by cells in the blood which help to destroy various infectious organisms that can cause disease.

Antimicrobials: Chemical or natural substances that kill or inhibit the growth of microorganisms such as bacteria (antibiotics), viruses (antivirals), and or protozoa (antiprotozoal).

Clostridial Diseases: Highly fatal diseases of young cattle caused by one of the *Clostridium* bacteria. Currently, the most used clostridial vaccination in cattle is the 7-way type, which protects against *Clostridium chauveoi* (blackleg), *Clostridium septicum*, *Clostridium sordelli* (malignant edema), *Clostridium novyi* (black disease), and three types of *Clostridium perfringens* (enterotoxemia).

Infectious Bovine Rhinotracheitis (IBR): A disease caused by a herpes virus, leading to respiratory symptoms, reproductive issues, and abortions in cattle. It is occasionally referred to as "red nose" and is known to trigger the onset of the shipping fever complex. Many IBR vaccines also provide protection against other respiratory viruses, including BVDV, BRSV, and PI3.

Vaccines stimulate the animal's immune system to produce antibodies. Vaccines are designed to protect the animal from diseases caused by infectious organisms such as viruses, bacteria, and protozoa.



Vaccines do not eliminate the risk of exposure to infectious agents, but they enhance an animal's capacity to defend against infections and reduce the severity of the disease in case of infection. Vaccines should be distinguished from other therapeutic drugs such as antimicrobials, as they are not used to treat diseases that are already occurring. Vaccines are primarily used to prevent a specific disease from occurring by creating immunity. Antimicrobials and most other therapeutic drugs are used to treat or control a specific disease condition.

Purposes of Vaccines:

PROTECT AGAINST DISEASE

- Some vaccinations are given to protect the animals from diseases that affect them directly, such as blackleg (clostridials) or pinkeye vaccine.

PREVENT PREGNANCY LOSS

- Diseases such as infectious bovine rhinotracheitis (IBR) and bovine viral diarrhea (BVD) may result in a loss of pregnancy. Vaccination against these diseases can prevent abortion.

Definitions:

Leptospirosis: A bacterium causing kidney disease, abortion in pregnant females, and sickness in calves. The five varieties of *Leptospira* most found in cattle include Hardjo, Icterohaemorrhagiae, Canicola, Pomona, and Grippotyphosa.

BVD (Bovine Viral Diarrhea): A disease caused by bovine viral diarrhea virus (BVDV), resulting in numerous problems, such as damage to the digestive and immune systems, pneumonia, abortions, or calf deformities, among others.

Coronavirus and Rotavirus: A virus that can cause diarrhea (scours) and dehydration in young calves. Some scours vaccines given to pregnant females will contain coronavirus. Vaccination of the pregnant dam raises the level of antibodies to coronavirus in her colostrum which provide the calf's immunity for the first few weeks and months of life.

***E. coli*:** A bacterium that can cause a life-threatening infection and diarrhea (scours) in newborn calves. Some scours vaccines given to pregnant females will contain *E. coli*. Vaccination raises the level of antibodies against *E. coli* in the dam's colostrum milk suckled by the calf after it is born.

PROMOTE PASSIVE IMMUNITY

- Immunity from vaccination in the cow is passed in the colostrum to the newborn calf.
- Some vaccines are given to cows in late pregnancy specifically for that reason, for example vaccines to prevent calf scours due to rotavirus, coronavirus, or *E. coli*.

Types of Vaccines:

MODIFIED LIVE VACCINES (MLVS)

- These vaccines contain a living infectious organism (bacterial or viral organisms) that has been “modified.”
- This modification means the virus or bacteria can stimulate immunity to produce protective antibodies without causing disease.
- Advantages of Modified Live Vaccines:**
 - Create a stronger and longer-lived immune response.
 - May not require a second (booster) vaccination.
 - Have a shorter meat withdrawal time.
- Disadvantages of Modified Live Vaccines:**
 - Require careful storage to avoid killing the live organism.
 - Require careful handling and clean syringes to avoid killing the live organism.
 - Require on-farm mixing before use.
 - Must be used immediately after mixing.

KILLED VACCINES

- Killed vaccines contain an infectious organism that has been “killed” through chemical or physical means, such as adding a chemical like formalin or using ultraviolet light.

Definitions:

Booster Vaccination: For young animals being vaccinated for the first time, a second, or *booster*, vaccination is often required a few weeks after the first, or primary, vaccination. A booster vaccination is required for killed vaccines to provide optimal protection. Failure to give the booster at the proper time could result in an incompletely protected adult animal even if that animal is vaccinated every year thereafter.

Subcutaneous (SQ or subq): Injection under the skin, not deep into the underlying muscle. If approved as a route of injection on the vaccine label, subcutaneous injection is just as effective as the intramuscular route and is the preferred route to avoid muscle damage.

Intramuscular (IM): Injection in the muscle, that is, with a needle penetrating directly into the muscle, usually at least one inch.

Pinkeye (Infectious Bovine Keratoconjunctivitis, or IBK): An infection of the eye caused by infection with the bacterium *Moraxella bovis*, spread by flies. Higher incidence of pinkeye may occur in herds not vaccinated against IBR virus. Pinkeye vaccines are available.

Blackleg: A highly fatal disease of young cattle caused by one type of *Clostridium* bacteria.

- Killed vaccines contain organisms or subunits of organisms that do not replicate or reproduce themselves in the animal following administration, but the various proteins on the bacteria or virus that stimulate immune system to produce protective antibodies without causing disease.
- Killed vaccines also contain an adjuvant that helps to alert the immune system to the vaccine.
- Advantages of Killed Vaccines:**
 - On-farm mixing is not required.
 - Safe for pregnant animals (minimal risk of abortion).
 - Partially used vaccine vials can be stored and reused.
 - No risk of the vaccine organism spreading between animals.
- Disadvantages of Killed Vaccines:**
 - Immunity is usually not as strong or long-lasting as MLV products.
 - Usually requires two initial doses to get an adequate immune response.
 - Usually more expensive than MLV.

Proper Handling of Vaccines:

READ AND FOLLOW THE LABEL DIRECTIONS, INCLUDING:

- The dose- its route of administration and timing.
- Withdrawal times.
- Expiration date and other safety information.

AVOID CONTAMINATION

- Do NOT mix different vaccines together in one syringe or combine other injectable drugs into the same syringe with vaccines.
- Mixing various vaccines together in one syringe can inactivate both vaccines.

- Keep needles and syringes clean to avoid infections at the site of injection.
- It is ideal to use a different needle for each animal to prevent the transmission of infectious diseases.
- Do NOT contaminate your vaccine bottle by utilizing a used dirty needle when you load your syringe. Only sterile needles should be used in the vaccine bottle.

ENSURE EFFICACY

- Do NOT use disinfectants to clean needles and syringes used to administer vaccines, especially MLVs.
 - Use hot water only for cleaning automatic syringes.
 - Disinfectants can leave a residue that destroys MLVs.
- Most MLVs must be reconstituted by adding sterile water to a dehydrated powder in a separate sterile vial.
 - Once the water is added, the vaccine should be used in 30 to 45 minutes.
- Keep the vaccine away from extreme heat or cold.
 - Use a cooler to protect reconstituted vaccines from extremes of cold, heat, and sunlight.
- Keep detailed records of what vaccines you use and include serial and lot numbers.
 - This information is crucial for monitoring the effectiveness of the vaccines and ensuring that animals receive the necessary boosters or re-vaccinations at the appropriate times.

Routes of Vaccines Administration:

INJECTABLE VACCINES

- Most of our vaccines were originally administered by injection either subcutaneously (SQ; under the skin) or intramuscularly (IM) in the neck. For example, a 7-way clostridial vaccine (Ultrabac® 7) is administered SQ.
- Use only 18- or 16-gauge needles, 1/2 or 3/4 inch long, to administer an SQ injection.

- Use only 18- or 16-gauge needles, 1 to 1½ inches long, to administer IM injections.
- It is advisable to use longer needles for adult cattle due to the thicker nature of their skin.

INTRANASAL VACCINES

- These vaccines immunity in the upper respiratory tract (the nose and the throat) to create antibodies at the surface.
- The antibodies can potentially inactivate the pathogen before it infects the animal the animal. One example is the intranasal BRD vaccine (e.g., Bovilis® Nasalgen® 3-PMH)

Vaccination Protocols:

- Consult your veterinarian to create a customized vaccination protocol for your herd.
- Timing of administration, the type of vaccine utilized, and the other vaccines necessary for animals will vary across farms and regions.

FACTORS TO CONSIDER FOR YOUR HERD

- Management practices
- Biosecurity considerations
- Geographical variations in disease

BASIC VACCINATIONS TO INCLUDE

- Infectious Bovine Rhinotracheitis (IBR)
- Bovine Respiratory Syncytial Virus (BRSV)
- Bovine Viral Diarrhea Virus (BVDV)
- Vaccines for clostridial diseases

Conclusions:

- Vaccines are a vital component of our biosecurity programs.
- Many of the diseases we vaccinate beef cattle for can have devastating economic consequences in terms of treatment costs, mortality, and reproductive losses.
- Work closely with your veterinarian and/or Extension specialist to customize a vaccination program that your cow herd.
- Remember to store and administer vaccines according to label directions and adhere to designated meat withdrawal times.
- Follow all other Beef Quality Assurance (BQA) guidelines for vaccination.



Additional Resources:

Try Vaccination Cost-Benefit Calculators for the benefits of using the Bovine Respiratory Disease (BRD) vaccines, and Bovine Viral Diarrhea (BVD) vaccines:

<https://www.beefresearch.ca/tools/cost-benefit-of-bvd-vaccinations>

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Planning Resources for Ensuring Effective Vaccines

English version:

https://www.cdfa.ca.gov/AHFSS/AUS/docs/AUS_BMPs_VaccineHandlingGuidelines_Producers.pdf

Spanish version:

https://www.cdfa.ca.gov/AHFSS/AUS/docs/AUS_BMPs_VaccineHandlingGuidelines_ProducersSP.pdf

Read “Alabama Beef Quality Assurance: Administering Cattle Health Products Properly,” for more information related to proper vaccine and drug administration.

<https://www.aces.edu/blog/topics/beef/alabama-beef-quality-assurance-administering-cattle-health-products-properly/>

Watch this webinar on how to use nasal vaccines effectively:

https://www.youtube.com/watch?v=vVsAP1SQT_w

Watch this webinar on Economical Vaccine Protocols:

<https://www.beefresearch.ca/topics/vaccination-of-the-beef-herd/>

Read “Beef Cattle Biological Chart.” This Biological Chart serves as a reference guide for vaccines and other biological products.

<https://www.beefresearch.ca/content/uploads/2023/05/Bovine-Biological-Charts.pdf>

This document was made in collaboration with the following organizations:

