Vaccinations for Beef Cattle: Best Practices and Considerations

A Guide for Beef Cattle Producers

***For definitions and further information on common infections & diseases, see pages 6-7.**

Vaccines stimulate the animal's immune system to produce **antibodies** which fight off infectious organisms, such as viruses, bacteria, or protozoa, that can lead to disease. Vaccines do not remove the risk of exposure to infectious organisms or eliminate the threat of disease. Instead, vaccines enhance an animal's ability to defend against the onset of infections or reduce the severity of the disease once infected. Vaccines should be distinguished from other therapeutic drugs such as **antimicrobials**, which are used to treat or control specific disease conditions.

Purpose of Vaccines

☐ Protect Against Disease

- Some vaccinations protect the animals from acquiring diseases that affect them directly, such as **blackleg** or **pinkeye**.

☐ Prevent Pregnancy Loss

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

Many **IBR** vaccines also provide protection against other respiratory viruses, including **BVDV**, **Bovine Respiratory Syncytial Virus (BRSV)**, and **Parainfluenza-3 (PI3)**.

☐ Promote Passive Immunity

- Vaccines can boost a cow's antibodies, which can then be passed to the newborn calf through her colostrum.
- To promote transfer of passive immunity, some vaccines are given to cows in late pregnancy.
  - For example, a vaccine is given to the dam to prevent calf scours due to **rotavirus**, **coronavirus**, or ***E. coli.***

Types of Vaccines

Modified Live Vaccines (MLVs)

- ☐ These vaccines contain a live organism (bacteria or virus) that has been "modified" or weakened.
- ☐ This modification (or "attenuation") means the virus or bacteria can stimulate immunity to produce protective antibodies without causing disease.

Advantages of MLVs	Disadvantages of MLVs
• Create a stronger and longer-lived immune response (compared to killed vaccines). • May not require a second (booster) vaccination. • Have a shorter meat withdrawal time.	• Require careful storage and handling to avoid killing the live organism. • Require on-farm mixing before use. • Must be used immediately after mixing.

Killed Vaccines

- ☐ The infectious organism has been "killed" or inactivated through chemical or physical manipulation, such as heat or formalin.
- ☐ The inactivated organisms, or subunits of the organism, do not replicate or grow inside the animal after administration.
  - The proteins on the inactivated organism stimulate the animal's immune system to produce protective antibodies, without causing disease.
- ☐ Killed vaccines also contain an adjuvant, substances which help to enhance the body's immune response to the vaccine.

Advantages of Killed Vaccines	Disadvantages 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 for short periods of time. • No risk of the vaccine organism spreading between animals.	• Immunity is usually not as strong or long-lasting as MLV products. • Usually requires two initial doses to get an adequate immune response. • Often more expensive than MLV.

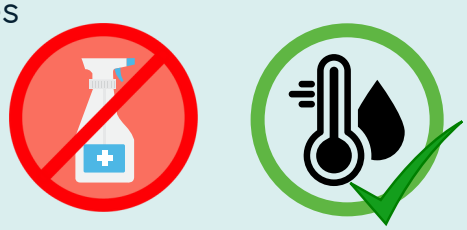
Handle Vaccines Properly

Read and Follow the Label Directions, Including:

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

Avoid Contamination

- ☐ Use a new needle for each animal to prevent the spread of infections.
  - A new needle will help to avoid sharing infections between animals or at the injection site.
  - Only use sterile needles to load syringes from the vaccine bottle. Dirty needles can taint the entire vaccine bottle.
- ☐ Do NOT use disinfectants to clean needles and syringes that are used to administer vaccines, especially MLVs.
  - Use hot water only for cleaning automatic syringes.
  - Disinfectants can leave a residue that destroy MLVs.



Ensure Efficacy

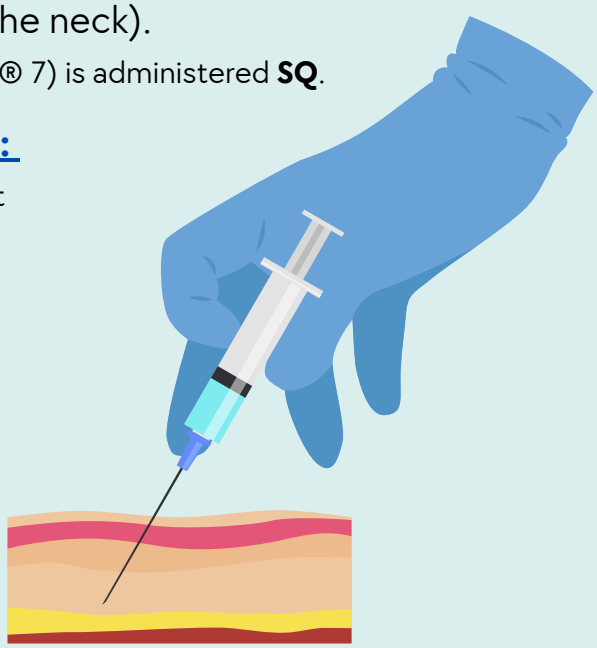
- ☐ Do NOT mix different vaccines together in one syringe or combine other injectable drugs into the same syringe with vaccines.
  - Mixing vaccines or other drugs can inactivate both.
- ☐ Most MLVs must be reconstituted by adding sterile water to a dehydrated powder in a separate sterile vial.
  - Once the water is added, the vaccine should be used within 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 which vaccines you use.
  - Include serial and lot numbers.
  - This information is crucial to monitor the effectiveness of the vaccines and ensure that animals receive the necessary boosters or re-vaccinations at the appropriate times.

Routes of Vaccines Administration

Injectable Vaccines

- [ ] Most cattle vaccines are 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**.



Select the correct needle size and length:

- It's recommended to use longer needles for adult cattle, due to the thickness of their skin.
  - **SQ Injections**
    - 18- or 16-gauge needles
    - ½ or ¾ inch long
  - **IM Injections**
    - 18- or 16-gauge needles
    - 1 to 1½ inches long

Intranasal Vaccines

- [ ] These vaccines initiate an immune response in the mucosal surfaces of the upper respiratory tract (the nose and the throat) to create **antibodies**.

- [ ] The **antibodies** can potentially inactivate the pathogen before it infects the animal.
  - One example is the intranasal **Bovine Respiratory Disease Complex (BRD)** vaccine (e.g., Bovilis® Nasalgen ® 3-PMH)

Vaccination Protocols

- [ ] Consult your veterinarian to create a custom vaccination protocol for your herd.
- [ ] The timing of administration, type of vaccine utilized, and 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

Core Vaccinations to Include

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

Currently, the most used clostridial vaccination in cattle is the "7-way" type, which protects against

- *Clostridium chauvoei* (blackleg)
- *Clostridium septicum*
- *Clostridium sordellii* (malignant edema)
- *Clostridium novyi* (black disease)
- Three types of *Clostridium perfringens* (enterotoxemia).

Add ***Clostridium hemolyticum*** if liver flukes are a concern and **Clostridium tetani** in calves if castration bands are used.

Conclusions

- [ ] Vaccines are a vital component of a farm's biosecurity program.
- [ ] 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 for 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.

Definitions

- **Antibodies (or immunoglobulins):** Proteins created by cells in the blood which help the body destroy various infectious organisms.
- **Antimicrobials:** Chemical or natural substances that kill or inhibit the growth of microorganisms such as bacteria (antibiotics), viruses (antivirals), or protozoa (antiprotozoals).
- **Intramuscular (IM):** Injection with a needle penetrating directly into the muscle, usually at least one inch.
- **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 incomplete protection, even if that animal is vaccinated every year thereafter.
- **Subcutaneous (SQ or subq):** Injection under the skin but not 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.

Common Infections & Vaccinations

- **Blackleg:** A highly fatal disease of young cattle caused by *Clostridium chauvoei*.
- **Bovine Respiratory Disease (BRD) complex:** A bacterial or viral upper and/or lower respiratory disease, often triggered by stressful events.
- **Bovine Respiratory Syncytial Virus (BRSV):** An important virus in the BRD complex.
- **Bovine Viral Diarrhea (BVDV):** A disease caused by bovine viral diarrhea virus (BVDV), which leads to more than just diarrhea. It can result in damage to the immune and digestive systems, pneumonia, abortion, and calf deformities.
- ***Campylobacter fetus venerealis* (Vibrio):** A sexually transmitted bacterium that causes early embryonic death. Often included in 5-way viral vaccines together with vaccines for multiple strains of Leptospirosis.
- **Clostridial Diseases:** Highly fatal diseases of cattle caused by one of the clostridial bacteria.
- **Coronavirus and Rotavirus:** Viruses that can cause diarrhea (scours) and dehydration in young calves. Vaccination of the pregnant dam raises the level of antibodies to coronavirus or rotavirus in her colostrum, which provide immunity to the calf during the first few 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 protect against pathogenic strains of *E. coli* and provide passive immunity via the dam's colostrum.

Common Infections & Vaccinations Continued

- **Epizootic Bovine Abortion (Foothill abortion):** Tickborne bacterium that causes late term abortions where the Pajaroello tick occurs.
- **Infectious Bovine Rhinotracheitis (IBR):** A disease caused by a herpes virus, leading to respiratory symptoms, reproductive failure, and abortions in cattle. It is occasionally referred to as "red nose" and is known to trigger the onset of the shipping fever complex.
- **Leptospirosis:** The *Leptospira* bacterium is contagious to a multitude of species, including humans. It can cause kidney disease, abortion in pregnant cows, blood-tinged milk, and sick or weak calves.
- **Parainfluenza-3 (PI3):** A respiratory virus that is part of the BRD complex.
- **Pinkeye (Infectious Bovine Keratoconjunctivitis or IBK):** An infection of the eye, caused by the bacterium *Moraxella bovis*. Scratches to the cornea can predispose cattle to pinkeye, such as grass awns (i.e., fox tails) or flies.

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://tinyurl.com/BRDCalculator
  - https://tinyurl.com/BVDCalculator
- **Planning Resources for Ensuring Effective Vaccines:**
  - **English Version:** https://tinyurl.com/VaccineHandlingGuideEnglish
  - **Spanish version:** https://tinyurl.com/VaccineHandlingGuideSpanish
- **Visit chapter 5 - Herd Health Management - of the latest BQA manual for more information on vaccination guidelines.**
  - https://tinyurl.com/HerdHealthBQA
- **View Cow Calf Pinkeye: Strategies for Management:**
  - https://tinyurl.com/CDFAPinkeye

Additional Resources

- **Watch this webinar on how to use nasal vaccines effectively:**
  - https://tinyurl.com/NasalVaccines

- **Watch this webinar on Economical Vaccine Protocols:**
  - https://tinyurl.com/EconomicalVXProtocol

- **Read "Beef Cattle Biological Chart." This Biological Chart serves as a reference guide for vaccines and other biological products.**
  - https://tinyurl.com/BeefCattleBioChart

- **Vaccine handling guidelines from CDFA:**
  - https://tinyurl.com/AUSProducerVxHandling

CDFA Antimicrobial Use and Stewardship | www.cdfa.ca.gov/ahfss/aus

UC Agriculture and Natural Resources | https://ucanr.edu/site/newborn-beef-calf-health

This document was made in collaboration with the following organizations:

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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