

Vaccinating Dairy Replacements for Bovine Respiratory Disease (BRD): Who, What, When, Why, How?

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Bovine Respiratory Disease (BRD) complex is a term used to describe what many people refer to as pneumonia. There are many ways and reasons why an animal may acquire BRD but it all comes down to 3 factors that are constantly interacting with one another: pathogens, environment and host.

Pathogens, aka, the bugs (bacteria and viruses) that can cause BRD are usually found in the environment. They can come from older animals who share the same air space, an already sick animal who has contact with others, shared nipples or water sources, contaminated housing or bedding. Some of these bugs can actually be a normal part of the upper respiratory tract microflora. Regardless, most of the time animals who get infected will either inhale or ingest a pathogen.

Environmental factors such as weaning, transport, animal co-mingling, overcrowding, inclement weather, dust and poor air quality/ventilation are stressors that could decrease the host's defense system making them more susceptible to invading pathogens. Many of these environmental stressors that contribute to BRD can be addressed using best management practices.

The host, in this case dairy heifers, have different levels of defense systems (from physical barriers such as mucus and skin to the immune system) to try and prevent the invasion of pathogens that cause disease. Part of having a strong healthy animal that can fight off threats of BRD is having a strong immune system. By vaccinating we can help improve this defense system.

WHY is BRD an important disease in dairy heifers?

BRD is a very costly disease. Dairy heifers who have pneumonia have decreased average daily gains and increased risk of dying or being culled. Treatment costs for antibiotics and anti-inflammatories are expensive. Animals can suffer significant and irreversible damage to their lungs which also impacts their milk production during their first lactation if they make it into the milking herd. What may be even more shocking is that through observation alone the average dairy farmer might only diagnose 1 in 5 animals with the disease. Therefore, there are potentially many animals that go undiagnosed and untreated.

WHY should you vaccinate heifers?

Vaccines act on the HOST in order to try and help build the host's immunity and defense systems. In simplified terms, when we vaccinate, we expose a safer version of a virus or bacteria to the animal so that she is no longer naïve to the threats that possibly surround

her. It is like showing her a wanted poster for the bacteria and/or viruses she has been vaccinated against. So, if exposed to that pathogen again, vaccination equips the host with the ability to recognize the pathogen as harmful, and mount a stronger and faster immune response.

Vaccination increases the host's ability to kill off the invading pathogens, which in turn decreases the risk of the animal to getting sick.

In the face of an outbreak, naïve animals (unvaccinated) are much more likely to die and have severe cases of pneumonia.

WHAT do we vaccinate for?

There are typically 5 main viruses that we vaccinate against which can cause BRD; infectious bovine rhinotracheitis (IBR, bovine herpesvirus Type 1), parainfluenza3 (PI3), bovine respiratory syncytial virus (BRSV) and bovine virus diarrhea (BVD) virus Types 1 and 2.

In addition to causing BRD, some viruses can have further health implications once a heifer is pregnant: the IBR virus can cause abortions and the BVD viruses can cause persistently infected (PI) calves.

Two bacterial agents associated with pneumonia that are commonly vaccinated against include *Mannheimia haemolytica* and *Pasteurella multocida*.

WHAT vaccines can I use?

Core vaccines (IBR, PI3, BRSV, BVD Type 1+2) are essential for overall herd health. In addition to preventing BRD these vaccines protect heifers from IBR abortions and giving birth to PI calves associated with BVD.

These core 5-way vaccines come in a 'killed form' or a 'modified live form'. Modified live vaccines (MLV) have an altered, less virulent form of an active virus in them whereas a killed vaccine carries an inactivated form of virus. Due to the active living virus in MLV, they can cause abortions in pregnant animals if they have not received an initial series (2 shots) of MLV as a heifer. Therefore, it is recommended that core vaccines for heifers are to be given in MLV form.

Non-core vaccines can be administered depending on when and where there is significant stress on the animal due to environmental factors, decreased host immunity or high pathogen load. These vaccines can be viral and/or bacterial. Some examples of non core vaccines include intranasal *Mannheimia haemolytica* and *Pasteurella multocida*; injectable *Mannheimia haemolytica* and intranasal IBR, PI3, BRSV.

Testing (offered by most veterinary clinics) may be necessary to determine which pathogen(s) are contributing to BRD, this will help in selecting the right non-core vaccine(s) for your farm.

HOW do we give vaccines?

Vaccines for cattle can be administered in three different ways; by injection in the muscle, injection under the skin or intranasally.

Injectable vaccines are meant to create an immune response throughout the entire body.

Intranasal vaccines boost immune responses locally around the upper respiratory tract where pathogens will first arrive if they are inhaled by an animal. Given intranasal vaccines act locally and do not cause an immune response in the entire body they tend to be shorter acting compared to injectable vaccines.

WHO can get vaccinated?

Heifers of any age, even newborns can be vaccinated in order to prevent BRD. However, not every vaccine is suitable to be used on very young animals.

BRD vaccines are used in order to try and prevent disease however if animals have been sick previously and have recovered, vaccination can still be administered to try and prevent new infections.

If young animals (<4 months of age) are getting sick, this may be an appropriate time to incorporate intranasal vaccines into your vaccine regime. These can give the calves a fast, local immune boost during high risk periods in their life. Because intranasal vaccines act locally and do not mount a systemic immune response, they do not interfere with maternal antibodies the same way injectable vaccines do.

WHEN should I vaccinate my heifers?

Although every farm vaccination protocol may look different there are common principles that should be followed when giving any type of vaccine. Vaccines should only be given to healthy animals. Ideally, they should be given prior to stressors (ex. weaning or pen moves) and not in conjunction with other stressors (ex. dehorning, excessive heat or cold).

Core vaccines have a very set time as to when they should be administered. These five-way core vaccines should be given to heifers **twice** before breeding. Most commonly they are administered at 4-6 months of age and again 30-45 days pre-breeding.

Prior to 4 months of age animals may still have circulating maternal antibodies that they received from their dam's colostrum as a newborn. These antibodies can interfere with

injectable vaccines making them less effective. Therefore, any animal vaccinated with an injectable core vaccine that is less than 4 months of age will still need two more injections to ensure adequate protection from BRD, abortion and BVD PI animals.

Non-core vaccines can be used when risk for BRD in the near future is high or as an insurance to provide heifers with extra BRD protection. Vaccines will be most effective if they are given to animals before they are exposed to BRD causing pathogens in their environment. Therefore, timing of vaccination is critical.

For example:

- A) If you want to help prevent pneumonia in the first 60 days of life, consider using an intranasal vaccine at birth or within the first week of life.
- B) If the environmental risk of BRD is low pre-weaning (ie. Calves housed in clean hutches, kept warm and dry) and you want to reduce the risk of acquiring BRD in the post-weaning period consider using an intranasal vaccine about 1 week prior to weaning.

Note: due to the shorter activity/protection of intranasal vaccines they can be used more frequently depending on environmental risk factors (ex. at birth and repeated pre-weaning)

Immunization through vaccination is an essential tool to manage the risk of BRD. The success of a vaccination program will depend on the correct timing and use of a variety of vaccines, the correct handling and administration of the vaccines, and a vaccination program design which is compatible with the management practices on the farm. With the huge welfare and economic implications from increased morbidity and mortality, involuntary culls, reduced average daily gains, treatment cost and reduced milk production, trying to prevent BRD using vaccines is a worthwhile insurance.