

3rd Annual TVMDL Amarillo
BOVINE RESPIRATORY DISEASE
Conference

July 7, 2018

Keys to Effective Vaccination of Calves
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Calf vaccination: overview

For decades, veterinary students were taught that young calves cannot respond to vaccination because of the blocking effects of maternal antibody. However, research has shown that calves vaccinated in the face of maternal antibody, while often not seroconverting, will often show evidence of T cell activation or, more importantly, protection from disease when they are later exposed to infectious agents in the vaccine. In general, successful vaccination of calves with moderate levels of maternal antibody requires two doses of vaccine given at least 2-4 weeks apart, but exceptions to this rule have been identified. However, these findings are not consistent; occasionally young animals vaccinated in the face of maternal antibody fail to develop a protective immune response to later challenge.

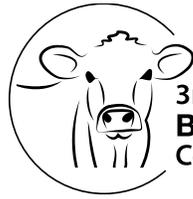
The reasons that calves are often but not always successfully protected when vaccinated in the face of maternal antibody are not completely defined, but they are likely related to the following factors:

1. The age of the calf at the time of vaccination, with calves less than 1 month old responding less reliably;
2. the concentration maternal antibody present at the time of vaccination;
3. the type of vaccine given to the calf;
4. the number of doses of vaccine given to the calf;
5. the route by which the vaccine is given;
6. the virulence of the infectious agents the calf is exposed to after vaccination, and
7. the outcome used to define success of vaccination.

Why might vaccinated calves get BRD anyway?

Given realistic expectations, if vaccinated calves develop BRD, multiple possible causes should be considered. Apparent vaccine failure may be due to mishandling of vaccines (e.g., improper storage of live vaccines); improper administration, so that a suboptimal dose is delivered; and incorrect timing of vaccination, such as vaccinating animals already incubating the disease, failing allow enough time for an immune response, or omitting boosters. In general, if only a single vaccination is possible, modified live viral (MLV) vaccines should be used, as they are usually more effective than inactivated vaccines after a single dose.

Factors that may lead to apparent vaccine failure through inability of the host to respond to vaccination include the presence of very high concentration of maternal antibodies (although vaccines can be effective in the presence of moderate levels of maternal antibody); age of the animal, with very young calves (< 1 month old) sometimes manifesting suboptimal immune responses; immunocompromise due to concurrent disease, poor nutrition, or high levels of stress; and genetic influences. Finally, poor



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husbandry may contribute to persistent problems with respiratory disease even in the face of appropriate vaccination.

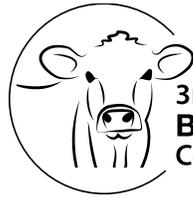
Also, consider expected versus actual pathogen exposure. Failure to vaccinate against pathogens to which animals are actually exposed may result in apparent vaccine failure. Regular postmortem evaluation with diagnostic microbiology may help confirm or rule out suspected pathogens and guide more rational vaccine choices. Nature of challenge impacts vaccine efficacy; the immune response to a good vaccine can be overcome by an overwhelming pathogen dose, an unusually virulent pathogen, or by concurrent exposure to multiple pathogens.

How can BRD vaccines best be used?

When using vaccines, remember basic principles: 1) animals need time to respond to a vaccine—at least 7 to 14 days in most cases. Don't expect much from vaccines given right before animals are exposed to infection. IBRV and BVDV vaccines have been shown to provide some protection within 3 -7days of administration, but this has not been proven for most other BRD vaccines. 2) Pay attention to the vaccine label; if the label says a booster vaccine is required, optimal immunity will not be induced if the booster is omitted. 3) If an animal is already infected with a pathogen, vaccination is unlikely to be helpful. Think about when cattle are at risk for infection and time vaccination so the last dose occurs 2 to 4 weeks before animals are expected to be exposed.

In addition to using appropriate vaccines rationally, biosecurity and management should also be used to decrease BRD risk. Especially producers should limit crowding; BRD is often a problem when unusually large numbers of cattle are brought together in close contact (due to severe weather or problems with facilities).

In working to limit BRD, remember to control non-respiratory infections; e.g., calf diarrhea increases risk for calf BRD. Ensure optimal transfer of maternal antibody from colostrum. If calves within the first month or two of life are developing BRD, problems with adequate passive transfer are particularly likely. Malnutrition of calves can play a role in BRD susceptibility through the impact of nutrition on immune responsiveness. While supplementation of nutrients (such as vitamins and minerals) in excess of required amounts has not reliably been shown to prevent disease, correction of deficiencies of protein, energy, and certain vitamins and minerals improves immune responsiveness. What is being fed to cattle may be important; some evidence indicates that high energy diets can increase the susceptibility of cattle to BRD.



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Keys to effective vaccination

When developing plans to vaccinate calves with circulating maternal antibody, keep in mind the following:

1. Calves are more likely than adults to require booster vaccinations, which should be given at least 2 to 4 weeks after the initial vaccination.
2. Intranasal vaccines may be more effective than injected vaccines in calves with moderate to high concentrations of maternal antibodies; however, immunity from intranasal vaccines may not last more than a few months.
3. Repeated doses of intranasal vaccines may not boost as effectively as repeated doses of injected vaccines.
4. Calves with very high concentrations of maternal antibody--such as those found in the first month of life in calves with excellent passive transfer --may not respond as well to vaccination as calves with moderate to low concentrations of antibody.
5. Vaccines should be administered so that the final dose is given no later than 2 weeks before the expected exposure of the group to infectious agents.

REFERENCES AVAILABLE ON REQUEST



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