

Maximizing Vaccination Programs for Organic Dairies

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Both conventional and organic dairies rely on vaccination programs to help prevent infectious diseases in their cattle. However, it could be argued that maximizing every bit of benefit from a vaccination program is even more crucial in organic dairy operations since treatment alternatives are more limited. Vaccination of organic dairy cattle is allowed for certification. But within that allowance, overzealous vaccination programs are discouraged. Thus, it is important that organic dairy producers consider how they can help stimulate an effective immune response and ensure that that immunity is present during the time of greatest risk to their cattle.

First, it must be emphasized sound herd management and husbandry can ultimately have a greater impact on the health of your cattle than any vaccine. Providing clean efficient facilities with adequate shelter will minimize exposure to environmental pathogens as well as minimize environmental climate stress. Don't forget that providing shade and cooling in the summer is just as important as providing protection from wind and rain in the winter. Basic biosecurity and biocontainment practices should be in place and enforced. To prevent the introduction of diseases, all new additions to the herd should be tested for specific pathogens. These may include *M. paratuberculosis* (Johnes), BVDV, BLV, *Strep. agalactia* and *Mycoplasma bovis* mastitis, hairy heel warts, internal GI parasites as well as other diseases. Animals should enter a quarantine pen for a period of at least 3 weeks before being introduced to the rest of the herd to allow them to stop shedding potential infectious viruses or bacteria that may infect other animals.

For herd biocontainment there should be a designated sick pen area. Animals with acute disease should be removed from contact with other animals and placed in the designated sick area for treatment until the disease is resolved. This will help minimize the spread to other animals in the herd. Also, young livestock should not be housed with adult livestock. This will help decrease the spread of pathogens such as *M. paratuberculosis* (Johnes Disease) to the young animals as well as help minimize the risk of spreading BVDV from a possible PI calf back to pregnant adult cattle. With a little attention and effort, you can clear some specific pathogens out of your herd and prevent that disease.

There are many factors that can affect the type, magnitude, and duration of immune response to a vaccine. Stress in general is immunosuppressive and can potentially decrease the response to vaccination. There are many things that can stress cattle including social stress, climate stress, environmental stress including frequent housing changes, changes in the availability and type of feed or water, and impatient or aggressive animal handling. The goal should be to maintain a stable living environment with minimal intervention and changes.

Nutrition also has a major impact on immune responses. The primary dietary nutrients that impact the immune system are energy, protein, zinc, selenium, copper, Vitamin E and Vitamin A. While Colorado is generally considered a selenium sufficient region, we commonly see deficiencies in copper and zinc. Appropriate attention should be made to vitamin and mineral supplements in the feed. If you are uncertain of your vitamin and mineral status you can work with your veterinarian to test blood or liver tissue samples to ensure that nutritional requirements are being met. Proper energy balance is best evaluated by monitoring the body condition score of cattle. Animals that are too thin or too fat have decreased immune responses. Lastly, there is increasing evidence that subacute rumen acidosis can suppress immune responses. Periodic evaluation of rumen fluid pH in select lactation groups can help monitor this so that appropriate changes to the ration can be made.

It is critical that vaccines be administered in a manner that will maximize their ability to prevent disease. One of the first considerations is whether to use a killed or modified live vaccine. Some of the newly released killed and modified live vaccines from a variety of biological companies have undergone significant improvements over the last decade. New virus isolates, higher antigenic loads, and better adjuvants have been incorporated into several of these vaccines. You should review the vaccines that you are currently using with your veterinarian to determine if you are using one of these newer products. The differences between the immune response to killed and modified live vaccines are becoming less pronounced. Both types of vaccines typically give excellent humoral antibody responses. Modified live vaccines are still generally believed to provide better cytotoxic immunity which is important for viral infections but not as important for bacterial infections. Some of the modified live vaccines can now also be used in pregnant cattle if the cattle have been vaccinated by the same product within a year. Thus, the decision to use a modified live or killed vaccine now depends more on your management and when you want to vaccinate to maximize protection for a specific disease.

As a general rule of thumb, modified live vaccines initially take 2 weeks to provide an effective immune response and killed vaccines take up to 5 weeks from the first dose. Booster responses can be seen within 1 week for both vaccines. Remember that killed vaccines generally require 2 doses to obtain an appropriate immune response. Failure to give these two initial doses of a killed vaccine in the interval recommended on the label can result in a lower or possibly even a failed immune response. If these vaccines do not properly immunize on the first attempt, they may not provide adequate response on later boosters as well. Maternal colostrum antibody interference can still affect the response to both modified live and killed vaccines. For young calves, there seems to be a window between 1-3 weeks and again after 5 weeks of age when the calf will respond best to vaccination. While there is evidence of eliciting some cell mediated immunity and memory when young calves are vaccinated, it is still important to make sure that you vaccinate all calves again at 4-7 months of age and also one month prior to breeding replacement heifers.

Developing a strong immune response to vaccination is a complex process. By paying attention to your management, the nutrition of your animals, the timing of your vaccination program, and the type of vaccine used you can help maximize the benefit of this tool in raising healthy cattle.