

'Y' the best vaccine for scours may not be a vaccine

Bobbi Brockmann for *Progressive Dairy*



Photo by Mike Dixon.

AT A GLANCE

While many think a vaccinated calf is an immunized calf, that is not the case. Providing calves with antibodies instead of a vaccine may be more effective for immediate scours protection.

If you could have any superpower, what would you choose? For newborn calves, their answer would most likely be immediate immunity.

When an animal's body is threatened by bacteria and viruses, its immune system has a secret weapon: antibodies. These antibodies are Y-shaped proteins that an animal naturally produces to help neutralize or kill foreign intruders. Think of the Y shape having two different arms that bind to and fight viruses and bacteria, giving the animal's body immunity. Sounds like a great superpower, right?

Unfortunately, calves are born with an immature immune system, and they can't develop their own antibodies until weeks after they hit the ground. That's why dairy farmers feed colostrum, which provides antibodies vital to preventing diseases. But a good dose of colostrum often is not enough to prevent certain diseases, such as scours. Most calves need elevated levels of specific antibodies to maximize immunity against scour-causing pathogens.

Traditionally, farmers have used pre-calving scour vaccines to increase antibody levels in colostrum

to protect against common scour-causing pathogens. While the science is sound, studies show that cows don't always generate an effective immune response from the vaccine, and their colostrum often comes up short.

During a recent colostrum study, independent researchers looked for general antibody levels (also called immunoglobulins) needed to achieve successful passive transfer, and for specific antibody levels needed to maximize immunity against scour-causing pathogens. In samples meeting the industry standard for general mass of antibody (50 grams per liter antibody), results showed that only 1% of cows had high concentrations of specific coronavirus antibodies, 3% were high in rotavirus antibodies and 7% provided colostrum that was high in *E. coli* antibodies.



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Instead of vaccinating cows, some farmers use an oral scours calf vaccine at birth. However, research showed that the calf-level vaccine is inactivated and rendered ineffective in the presence of colostrum. Researchers analyzed colostrum samples in vitro using two designs to replicate on-farm use of the oral scour calf-level vaccine. In the first design, they mimicked the on-farm delivery of colostrum and the vaccine together. In the second design, researchers waited 30 minutes after giving the vaccine to add colostrum, mimicking an on-farm colostrum delay. When the colostrum was immediately added to virus samples from the modified-live vaccine, the vaccine was 100% neutralized by the colostrum antibodies in every sample, regardless of whether or not the host cow was previously vaccinated with a

dam-level vaccine. When researchers withheld the colostrum for 30 minutes, there was no statistical difference in the delay versus the non-delayed test. The majority of the vaccine was still neutralized. The conclusion: This vaccine can actually do more harm than good. As maternal antibodies from colostrum bind to the vaccine virus, there are fewer antibodies to achieve successful passive transfer needed to combat naturally occurring pathogens. The lower circulating level of antibodies is detrimental to the calf's overall immune system.

Vaccination is not the same as immunization

Just because a cow has been vaccinated doesn't mean she is protected. "Often you hear the two words vaccination and immunization used synonymously and they're not the same thing," Dr. Chris Chase, immunology expert and professor in the department of veterinary and biomedical sciences, South Dakota State University (SDSU), said during episode 1 of the First Defense podcast. "If the animal doesn't respond to the vaccine, it's not immunized."

Results confirmed that nearly 80% of operations were noncompliant with label requirements, leaving calves at risk and farmers wasting money on vaccines.

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To better understand why vaccines may be inadequate, a leading animal-health marketing research firm completed a survey capturing the deviation level outside of vaccine label requirements. The study represented 100 dairies nationwide and 77,154 lactating cows. Results confirmed that nearly 80% of operations were noncompliant with label requirements, leaving calves at risk and farmers wasting money on vaccines.

While vaccine effectiveness depends on many uncontrollable factors, such as weather and stress, following label requirements should fall into the more “controllable” category. However, this research showed that failure to follow labels, also known as protocol drift, is a big reason vaccinations aren’t as effective on the farm as they are in a lab. According to the study, about 40% of farmers did not vaccinate all first-calf heifers. Of the heifers vaccinated, more than one-third didn’t receive the second shot required for primary vaccination. And then, farmers missed giving nearly 25% of the cows the necessary annual booster for previously vaccinated lactating cows.

Timing of administration also can complicate the process, as pre-calving scour vaccines are only effective if given during the time frame outlined on the label. Farmers reported that more than one-third of first-calf heifers received the required second dose outside the label-required time period pre-calving. In addition, almost two-thirds of farmers who administered the annual booster to lactating cows estimated they gave it earlier or later than prescribed. Furthermore, label requirements assume that farmers can pinpoint the actual calving date, even for cows running with a bull. In the survey, farmers reported that 20% of cows calved two or more weeks off the projected calving date. This discrepancy likely puts these cows outside of the critical window needed to maximize scour-preventing antibody concentrations in the colostrum.

Based on the survey’s final questioning sequence, researchers analyzed compliance across all operations and determined that protocol drift occurred at equal rates for both first-calf heifers and pregnant cows, leading to nearly 80% of operations being noncompliant with label requirements directly related to the vaccine’s effectiveness.

Provide immediate immunity

Scientists in human health have developed antibody medicines that mimic naturally occurring antibodies. They optimized these preformed antibodies to target specific diseases, allowing for a greater number of antibodies to be present in the body to fight certain diseases without affecting other cells.

These preformed antibodies are also Y-shaped, just like those that occur naturally, and the technology is available for newborn calves. Given directly to the calf, these antibodies are derived from colostrum and neutralize pathogens

without taxing the immune system like a vaccine can. There’s no vaccination stress and vaccine variability is removed because antibody levels are guaranteed in every dose. Calves receive an instant dose of immunity from the most common scour pathogens.

During a recent immunology symposium, Chase highlighted the use of these preformed antibodies to enhance immunity for newborn calves. According to the SDSU professor, the preformed antibodies protect against both bacterial and viral scours. With vaccines, there are too many outside factors, making a

100% immunization response rate biologically impossible. But with an antibody product, Chase said farmers know exactly what they’re getting – a known and proven level of protection against scours.

When calves possess the superpower of immediate immunity, dairy farmers gain a powerful advantage in their work to maximize herd health. 🐄

References omitted but are available upon request.

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