

First Defense Tri-Shield® Reduces Rotavirus Shedding in Newborn Calves

Protect the calf and the environment

Quick Read

- FIRST DEFENSE TRI-SHIELD is a single-dose USDA approved veterinary biologic containing guaranteed levels of *E. coli*, Coronavirus and Rotavirus hyper-immunized colostrum antibodies.
 - FIRST DEFENSE TRI-SHIELD is proven to be effective for passive immunity against scours causing pathogens, specifically; aiding in the reduction of mortality and morbidity from scours caused by K99+ *E. coli* and Coronavirus while also reducing the severity and duration of scours caused by Rotavirus.
 - Rotavirus disease amplifies within a herd when infected calves shed the pathogen into the environment thereby exposing and potentially infecting herd mates.
 - Limiting shedding will limit environmental pathogen load, reduce level of disease challenges herd mates are exposed to, and reduce the frequency and severity of rotavirus scour outbreaks.
 - FIRST DEFENSE TRI-SHIELD significantly reduced rotavirus shedding during the height of the disease (day 2 post challenge) in calves who achieved successful passive transfer as a result of a quality colostrum feeding (1 gallon, pooled and pasteurized) after birth.
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Risk factors associated with Rotavirus disease outbreaks

Disease amplification or a significant disease outbreak can occur in a population of calves when pathogens propagate within infected calves and are broadcast/shed by these calves into the environment where all calves are housed. This environmental pathogen load builds-up to a level which can overwhelm the immune status of herd mates, creating significant illness and death loss. A core driver of new rotavirus infections is large exposure to the pathogen shed into the environment over a short span of time, particularly under conditions of stress. It has been suggested that the major mode of rotavirus spread is from actively infected calves to susceptible ones. Increasing environmental contamination will amplify diarrheal disease in calves (Holland, 1990). Calves will excrete rotavirus in feces starting the second day of infection. Infected feces may contain as many as 10^{10} virus particles/gram (Radostits et al 2007).

Decreased shedding and the accumulation of virus in the calf environment are very important risk factors in rotavirus morbidity and diarrheal disease amplification throughout the calf herd. The virus survives in feces for several months and is resistant to many disinfectants (Radostits et al 2007). A product that reduces the number of intestinal cells infected and the quantity of virus shed should decrease disease amplification and morbidity in a herd of calves. This product could not only impact individual calf health but also would provide partial herd immunity in controlling the lateral spread of disease through less environmental contamination.

Study Design

The objective of this trial was to evaluate if FIRST DEFENSE TRI-SHIELD would reduce rotavirus shedding in calves receiving FIRST DEFENSE TRI-SHIELD at birth when rotavirus exposure mimicked typical on-farm conditions (day 6 challenge) and with all calves receiving quality colostrum aiming for successful passive transfer.

The treatments were

- FIRST DEFENSE TRI-SHIELD: calves received one 30-cc tube of FIRST DEFENSE TRI-SHIELD after birth followed by 4 liters of pooled colostrum.
- Control: calves received 4 liters of pooled colostrum and a placebo tube containing everything within the FIRST DEFENSE TRI-SHIELD formula except the active ingredient (specific antibodies for *E. coli*, coronavirus, and rotavirus).

Study Design (continued)

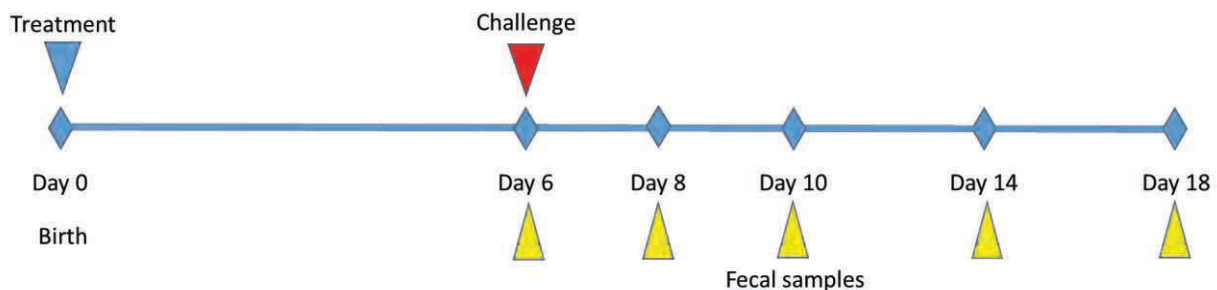
Twenty calves were enrolled. All calves were processed according to “clean sand” collection protocol at birth with navels dipped immediately. This “clean sand” model is highly controlled yet conducted within a commercial facility. Calves were then moved to the processing area where the navel was again dipped with a tincture of iodine and the following prophylactics administered: vitamins, intranasal vaccine, and Excede®. Immediately after processing, and within 30 minutes of birth, calves received either FIRST DEFENSE TRI-SHIELD or Placebo randomly administered. Veterinary staff administering treatments and recording data were blinded to the treatment. Four liters of clean, quality, pooled colostrum was administered 2 hours after initial processing. Initial processing also included unique individual animal identification, body weight, blood samples for FTP and BVD PI status were taken.

Calves were housed in individual hutches with wire fence in the front representing individually housed set-ups typical for the industry. Hutches were placed in naïve environment without a history of housing calves or cows.

On Day 6 all calves were challenged with live rotavirus. Health scores, including fecal scores, were recorded twice daily. Fecal samples from all calves were collected for fecal shedding evaluation on days 6 (before challenge), 8, 10, 14, and 18. Experimental design is illustrated in Figure 1.

Quantitative PCR was used to quantify amount of rotavirus DNA particles present. Threshold cycle frequency was used to compare rotavirus shedding between treatments. The higher threshold cycle frequency the less rotavirus particles being shed into the environment.

Figure 1. Experimental design.

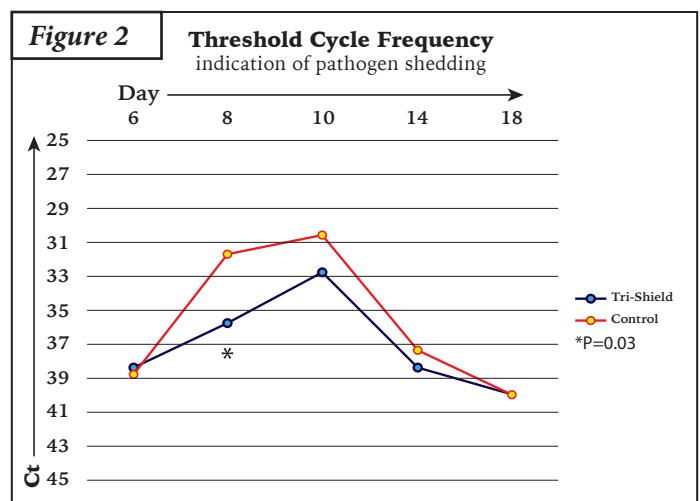


Results

There were no calves that had failure of passive transfer, defined as a TP < 5.0 g/dL. There was a trend ($P = 0.07$) for the Control group to have a higher total protein levels (6.5 vs 6.2 g/dL).

There were no differences observed in clinical symptoms (scour scores, scour days, treatments) between FIRST DEFENSE TRI-SHIELD and Control calves. The live rotavirus pathogen dose was not high enough to manifest clinical signs but was high enough to inducing shedding.

Control calves tended to have higher shedding of rotavirus with day 8 being significantly higher than in FIRST DEFENSE TRI-SHIELD calves. The threshold cycle frequency was 4.52 cycles lower which would correspond to approximately 1.5 log greater shedding of rotavirus in calves not receiving FIRST DEFENSE TRI-SHIELD. See Figure 2.



Conclusions & Discussion

FIRST DEFENSE TRI-SHIELD provided an additive effect to a quality colostrum program by significantly reducing rotavirus shedding in feces of calves even when they achieved successful passive transfer. Disease amplification and transmission to herd mates can be minimized by limiting the amount of rotavirus in the environment. Quantitative PCR (qPCR³) measures the amount of rotavirus DNA in a fecal sample. DNA can still be detected even when the virus is no longer viable, pathogenic or able to infect herd mates. Antibodies in Tri-Shield bind to the pathogen making it no longer infectious, but the rotavirus DNA would still be present in this case. The reduction in shedding and impact on the spread of disease could be much greater than this methodology was able to detect.

For more information: mail@immucell.com or 800-466-8235

References

1. Holland R: Some infectious causes of diarrhea in young farm animals. Clinical Microbiology Reviews, 1990; 345-375.
2. Radostits O.M, Gay C.C, Hinchcliff K.W, Constable P.D: Veterinary medicine-A textbook of the diseases of cattle, horses, sheep, pigs and goats. USA: Saunders 10th edition; 2007. p: 1286-1296.
3. qPCR Definition: measures the number of DNA amplification cycles that are required for a sample to reach a given threshold. The more amplification cycles required, the lower the amount of target DNA in the sample. After 40 amplification cycles the sample is considered to be negative for the target DNA.

Research Team

Trial Coordinator: Andrew Skidmore DVM, PhD Site Investigator: Jan Gawthrop DVM, Calf Care, North Manchester, IN

Collaborators:

David Hurley BA, PhD University of Georgia College of Veterinary Medicine

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Lab Analysis: University of Wisconsin Diagnostic Lab

Statistics: ACER Consulting, Guelph, ON



RESEARCH PROVEN



"You can just compare calves that you have on First Defense® compared to calves that aren't. There's definitely a big difference. Maybe not day one, but as they're in their first three weeks when they're in the calf hutches and they're on milk. Once they start grain, we noticed a big difference on their milk and grain intakes, as well as just being healthier all around."

– Zach Damrow, Seagull Bay Dairy, American Falls, ID



"The thing that I like about First Defense is that you give to the calf as soon as it's born. There are some products on the market today that you have to give to the calf at birth and the recommendation is to wait 30 minutes or longer before you can feed colostrum. It's so hard to tell a dairyman or a calf raiser to delay feeding colostrum when that's the most important thing to give the calf."

– Steve Hayes, DVM, Day 1 Technology, Winona, MN



"Prior to adding First Defense® to our regimen, our calves would always run into problems with salmonella after having scours seven to 10 days after birth. We have been using First Defense® at Cal Poly State University's dairy unit and have seen calves getting through the first two weeks of life stage really successfully. We would recommend First Defense® to anyone. This product is simple to administer and produces results."

– Rich Silacci, Cal Poly State University, San Luis Obispo, CA



"The First Defense® product is a hyper-immunized colostrum. The antibodies are condensed down into a bolus. Once it gets into the gut, those antibodies are absorbed and help protect the calf. Calving areas can get used over and over. That second half of that calving season, there is probably a lot antigens built up – First Defense® is a great supplement to provide some added protection."

– Lance Kurtz, DVM, Countryside Vet Clinic, Fullerton, NE



"I recommend producers implement First Defense® in their calf protocols even when using cow scour vaccines. First Defense® provides calves with consistent protection by delivering a timely and accurate dose of antibodies they need to avoid scour outbreaks."

– Joe Strahm, DVM, Pender Vet Clinic, Pender, NE



"We have been using First Defense® for the last 3-4 years and are really happy with the product. For us it's important, it's a big investment and a huge return. The product is convenient and versatile. Knowing we have protection as soon as the calf hits the ground is satisfying and comforting. This product gives assurance."

– Dan Kullot, DVM, Syracuse Dairy, Syracuse, KS