

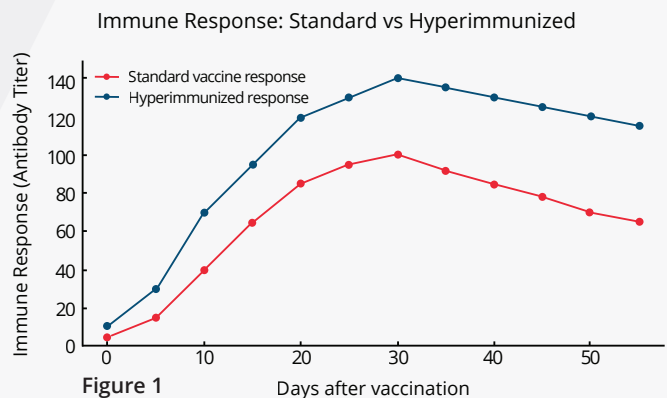
Nasdaq: ICCG researchers referenced: M. Wustenberg, DVM, J. Zinckgraf, PhD

Hyperimmune colostrum: taking nature's most powerful defense to the next level

Summary of peer-reviewed publications and internal research evaluating the impact of hyperimmunization on colostrum composition and neonatal calf health.

QUICK READ

- Hyperimmunization is the process of giving multiple closely timed vaccinations against a specific antigen.
- When cows are hyperimmunized prior to colostrogenesis, it leads to a marked increase in antigen-specific antibodies (Figure 1) as well as an enhanced concentration of non-specific immune components such as growth factors, oligosaccharides, lactoferrin, and cytokines in colostrum.
- This study compares specific antibody concentrations in colostrum collected from non-vaccinated cows, cows receiving a commercial vaccine according to label, and cows hyperimmunized with the vaccines used to produce the First Defense® line of products (Dual-Force® and Tri-Shield®).



BACKGROUND

Few, if any, commercially available products employ a hyperimmunization strategy to enhance the antibody profile of bovine colostrum—apart from the First Defense line. These veterinary biologics are developed using proprietary vaccines containing selected antigens that stimulate high titer development of neutralizing antibodies against the most common calf scours pathogens.

Dual-Force is derived from cows hyperimmunized with a combination *E. coli*/coronavirus vaccine, while Tri-Shield adds antibodies produced using a novel rotavirus vaccine based on virus-like particle (VLP) technology. Because newborn calves are immunocompromised and respond poorly to vaccination, this hyperimmunization approach is applied to the cow – producing hyperimmune colostrum that becomes the active ingredient in the First Defense line of products. Following hyperimmunization, colostrum is purified, concentrated, and potency tested. The result is a consistent dose of neutralizing antibodies targeting *E. coli*, coronavirus, and rotavirus that can be delivered orally to newborn calves providing immediate passive immunity against these scour pathogens.

STUDY DESIGN

Six individual cow samples of first-milking colostrum were included in each treatment group. *E. coli*, coronavirus, and rotavirus titer levels were quantified using an Enzyme-Linked Immunosorbent Assay (ELISA) for *E. coli* and coronavirus, and a Virus Neutralization Test (VNT) for rotavirus.

THE GROUPS

1. Unvaccinated controls – no *E. coli*, coronavirus or rotavirus vaccine ahead of current lactation
2. Cows vaccinated with a commercial product, during the dry period, according to label (ScourGuard®, Zoetis®)
3. Cows hyperimmunized, during the dry period, with the *E. coli*/coronavirus vaccine used to produce the neutralizing *E. coli* and coronavirus antibodies in Dual-Force
4. Cows hyperimmunized, during the dry period, with the rotavirus vaccine used to produce the neutralizing rotavirus antibodies in Tri-Shield

INTERPRETING THE DATA

Hyperimmunization produced a consistently significant increase in pathogen-specific antibody concentrations in colostrum compared to both commercial vaccination and unvaccinated controls (Figure 2).

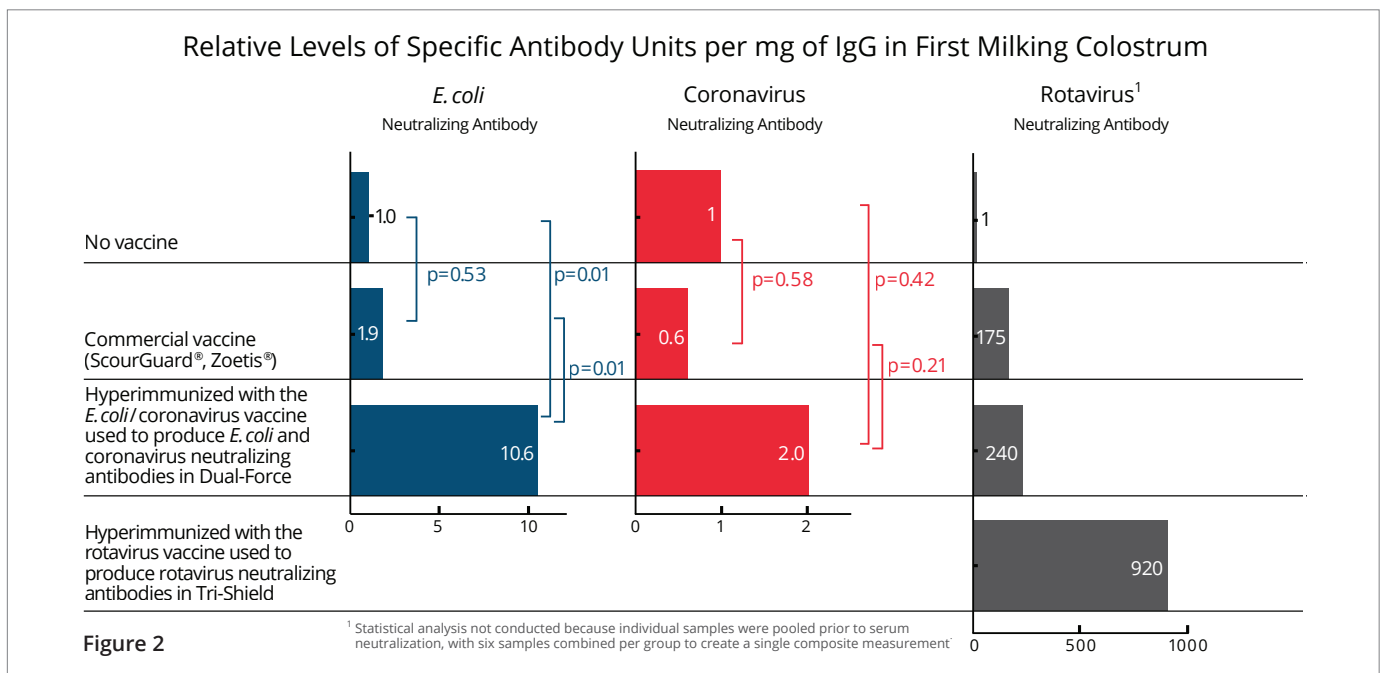
***E. coli*:** Cows hyperimmunized with the *E. coli*/coronavirus combination vaccine used to produce neutralizing-antibodies in Dual-Force showed a 10.6-fold increase in unit of *E. coli* antibody per mg IgG relative to unvaccinated controls, and a 5.6-fold increase relative to commercial vaccination.

Coronavirus: Although differences were not statistically significant, cows hyperimmunized with the *E. coli*/coronavirus combination vaccine tended to have approximately 2.0-fold higher coronavirus specific antibody levels than both unvaccinated and commercially vaccinated controls.

Rotavirus: Rotavirus-specific antibody levels showed the most striking response for the hyperimmunized groups.

- Hyperimmunization with the rotavirus vaccine used to produce rotavirus-neutralizing antibodies in Tri-Shield produced a ~920-fold increase over no vaccine.
- Hyperimmunized cows given only the *E. coli*/coronavirus vaccine – without any rotavirus antigen – still demonstrated a 240-fold increase in rotavirus antibody concentrations compared to no vaccine, surpassing the 175-fold increase achieved with commercial vaccination. This result suggests the hyperimmunization process may broadly amplify colostrum immune factors beyond the specific antigens administered.

Collectively, this data demonstrates that hyperimmunization significantly amplifies colostrum antibody concentrations, with the largest effect observed for rotavirus.



DISCUSSION

The First Defense product line (Dual-Force and Tri-Shield) is produced through a targeted hyperimmunization process designed to generate specific antibodies against the primary pathogens that cause neonatal scours. Independent, third-party animal challenge studies, verified by the USDA Center for Veterinary Biologics, have demonstrated that these products effectively reduce calf mortality, morbidity, and pathogen shedding. The benefits observed in these trials, briefly summarized below, are likely attributable to the elevated specific-antibody concentrations and enhanced levels of other immune factors driven by the hyperimmunization process.

In colostrum deprived calves:

Oral administration of Dual-Force to colostrum-deprived calves reduced diarrhea severity, dehydration scores, and mortality by 50–60% when challenged with either K99+ *E. coli* or coronavirus. In a rotavirus challenge, calves receiving Tri-Shield had decreased severity of diarrhea from 86% to 57%, shortened duration from 2.7 to 1.7 days (Figure 3), and significantly delayed peak viral shedding compared to controlled calves which shed most heavily at 3.5 days post-infection, creating a high environmental pathogen load during a critical window of herd vulnerability.

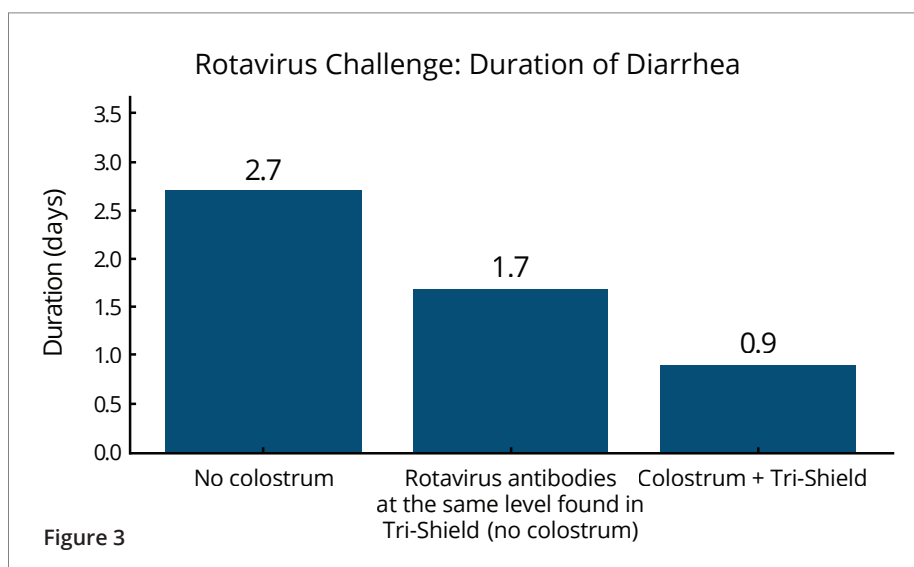


Figure 3

Combined with regular colostrum – a more realistic scenario: Under a strong rotavirus challenge, the Tri-Shield combination of *E. coli*, coronavirus, and rotavirus specific antibodies generated through hyperimmunization protected 93% of calves from severe diarrhea, reduced overall disease length by 1.8 days (Figure 3), and significantly reduced the shedding of rotavirus.

A follow-up study confirmed that, even in calves with successful passive transfer, rotavirus shedding remained elevated – approximately 1.5 log higher on day 8 – compared to calves that received Tri-Shield in combination with a high-quality colostrum feeding. This suggests not only an opportunity to improve individual calf health, but also a population effect by limiting environmental pathogen load and minimize disease transmission to other herd mates.

SOURCES

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