



Knowledge

Immune response of cows, calves to *Clostridium Perfringens* Type A Toxoid

SUMMARY

A growing economic concern for dairy and beef producers is *Clostridium perfringens* Type A and its alpha toxin that are associated with deadly gastrointestinal diseases in cows and calves. Because treatment measures are expensive and often unsuccessful,

prevention and management strategies are critical.

A Colorado State University study was conducted to determine if vaccinating pregnant cows and heifers with **Clostridium Perfringens Type A Toxoid** from Novartis Animal Health US, Inc. affected the serum neutralizing antibody titer to alpha toxin in

the colostrum-fed calves of the vaccinated dams.¹

Results found that **Clostridium Perfringens Type A Toxoid** administered during the dry period led to increased anti-alpha toxin antibody in cows, as well as increased levels in their colostrum-fed calves.

Introduction

Clostridial organisms occur naturally in the environment and the intestinal flora of cattle. However, dietary changes and other conditions, such as parasite infestation, may produce a favorable growth environment for these bacteria, causing them to produce potent toxins. In the case of *Clostridium perfringens* Type A, the primary concern is alpha toxin.

The alpha toxin of *C. perfringens* Type A is associated with hemorrhagic bowel syndrome (HBS) in cows, as well as abomasal ulcers, abomasal hemorrhage and abdominal tympany in calves. Because treatment is rarely successful, prevention is key.

Standard seven-way clostridial vaccines do not contain *C. perfringens* Type A.

Clostridium Perfringens Type A Toxoid, a conditionally licensed vaccine for cattle, aids in the control of disease syndromes caused by the alpha toxin of

C. perfringens. It is built with an isolate that is a prolific producer of alpha toxin via a manufacturing process that inactivates the toxin, therefore, maintaining a high level of toxoid in the product. Thus, unlike standard seven-ways, it stimulates a highly specific, neutralizing response against the alpha toxin of *C. perfringens*.

Study protocol

Researchers at Colorado State University recently studied the effect that vaccinating with **Clostridium Perfringens Type A Toxoid** has on pregnant cows and heifers, and their offspring, through colostrum.¹

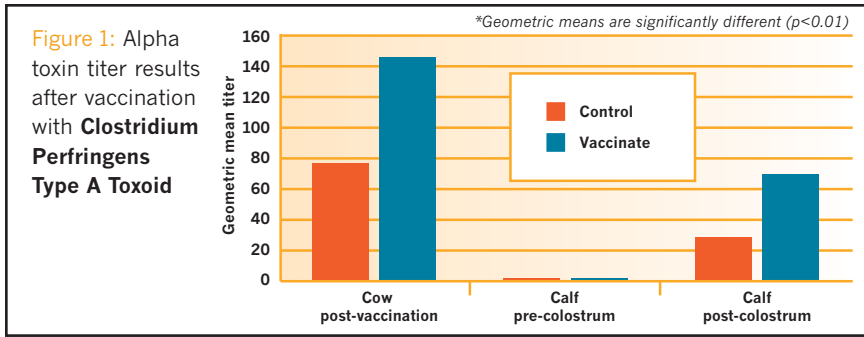
Forty-nine cows and 20 heifers from a 600-cow commercial dairy in Colorado were randomly assigned to receive two doses of either **Clostridium Perfringens Type A Toxoid** or a control preparation in late pregnancy. Cows were vaccinated with a 2-mL dose of vaccine or the control

preparation subcutaneously at dry-off (48 to 66 days prepartum) and again three weeks prior to calving. The 20 heifers were injected initially at four weeks, and again at two weeks prior to their expected calving date. Serum samples were gathered from cows and heifers at first vaccination and seven days after the second vaccination.

Calves received two to three liters of fresh colostrum within 12 hours of birth. Serum taken from calves prior to receiving colostrum was analyzed, as was serum taken at 24 to 96 hours after receiving colostrum. Antibody titers were tested using a mouse protection assay.

Results

Results found the calves that received colostrum from a dam that had been vaccinated with **Clostridium Perfringens Type A Toxoid** had geometric mean titer levels of 71 vs. 27 for calves that received colostrum from control



cows. Geometric mean titer levels also were significantly higher for the cows vaccinated with *Clostridium Perfringens* Type A Toxoid – 145 for vaccinated cows compared to 78 for control cows.

Conclusion

Scientists found that relative to calves born to control animals,

calves born to dams that had been vaccinated twice with *Clostridium Perfringens* Type A Toxoid during late pregnancy had higher antibody titers to *C. perfringens* Type A alpha toxin following ingestion of colostrum.

Study results showed that *Clostridium Perfringens* Type A Toxoid administered during

the dry period led to increased anti-alpha toxin antibody in cows, as well as increased levels in their colostrum-fed calves.

This conditionally licensed vaccine is the result of 10 years of Novartis research and experience creating custom vaccines containing *C. perfringens* Type A. It is produced under specific growth conditions to provide high levels of alpha toxin antigen.

***Clostridium Perfringens* Type A Toxoid** is flexible, and fits with routine vaccination procedures. A 2-mL dose is given subcutaneously in the neck, with a booster two to four weeks after the initial dose. Animals should be revaccinated annually or as recommended by the veterinary practitioner.

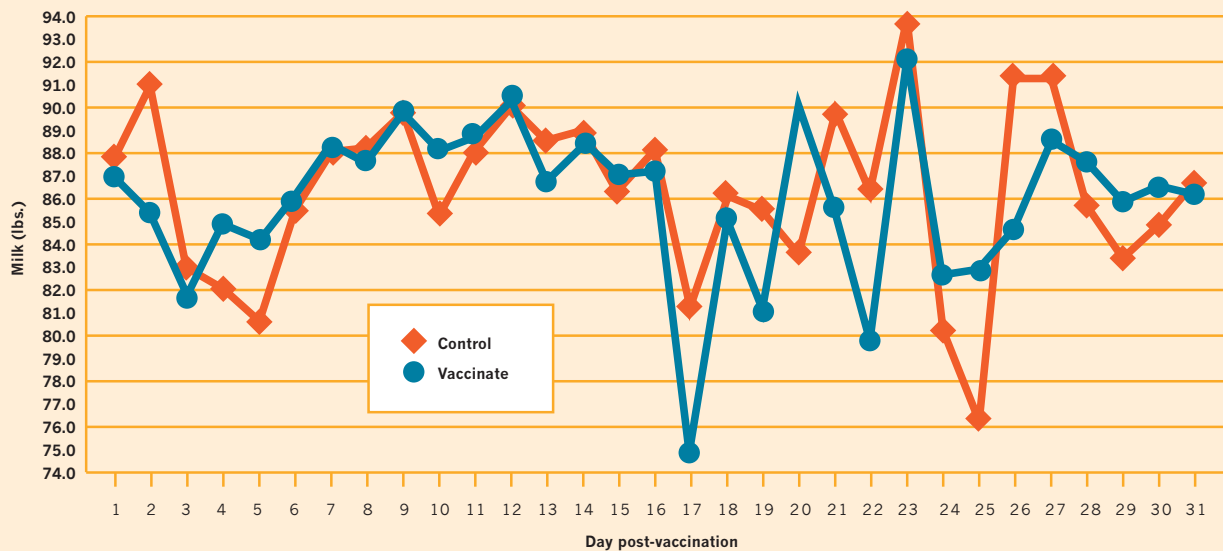
No effect on milk production

In a milk production trial with *Clostridium Perfringens* Type A Toxoid, researchers took milk weights for seven days prior to vaccination and 31 days post-vaccination. Data on 92 vaccinated animals and 96 control animals were used in the analysis.

Researchers analyzed post-vaccination daily milk production by a repeated measures analysis of variance using a model that included the effects of treatment group and days. The interaction between treatment and days used a heterogeneous compound symmetry covariance structure.

Results show no significant difference ($p=0.79$) between treatment groups.² Daily differences between treatment groups are shown in Figure 2.

Figure 2: Daily adjusted means for post-vaccination milk production with *Clostridium Perfringens* Type A Toxoid



1. Van Metre D. Passive transfer of neutralizing antibodies to *Clostridium perfringens* Type A alpha toxin in dairy calves fed colostrum from immunized dams. Paper presented at Annual Meeting of American Association of Bovine Practitioners 2006; Saint Paul, Minnesota.
 2. Data on file, Novartis Animal Health US, Inc.

