

# Serum Neutralizing Antibody to the Alpha Toxin of *Clostridium perfringens* type A in Dairy Calves Fed Colostrum from Immunized Dams

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## Introduction

*Clostridium perfringens* type A has been associated with gastrointestinal disease in dairy and beef calves. The primary virulence factor of this organism is alpha toxin, a calcium-dependent, phospholipase exotoxin. The goal of this study was to determine if immunization of pregnant dairy cows and heifers with a commercially available vaccine<sup>a</sup> affected the serum neutralizing antibody titer to alpha toxin (AbAT) in their colostrum-fed calves.

## Materials and Methods

Holstein, Brown Swiss and Jersey cows (n=49) and heifers (n=20) from a 600-cow commercial dairy in Colorado were randomly assigned to receive two doses of either a vaccine or control preparation (adjuvant + vehicle) in late pregnancy. Subcutaneous injection (2 ml) of vaccine or control preparation was administered to cows at dry-off (48-66 days prepartum) and repeated at about three weeks prior to the expected calving date. For heifers, the initial injection was given at about four weeks prior to the expected calving date and repeated two weeks later. Blood samples were obtained from cows and heifers at enrollment and seven days following the second injection. Serum samples were obtained from calves as soon as possible after birth (pre-suckle). Calves were fed two to three liters of fresh colostrum from the dam within 12 hours of birth. A second serum sample was obtained from calves at 24 - 96 hours postpartum (post-suckle). Antibody titers were measured by mouse protection assay. Data were analyzed by linear regression.

## Results

One week following the second injection, the geometric mean of the serum AbAT of vaccinated cows (145.3, 95% CI, 100.5-190.0) was significantly higher than that of control cows (77.5; 95% CI, 32.3-122.8) (P < 0.01). The geometric mean of the post-suckle serum AbAT of calves born to immunized dams (70.8, 95% CI, 43.3-98.5) was significantly higher than that of calves born to control dams (27.4, 95% CI, 16.5-43.5) (P < 0.01). No significant association was detected between the post-suckle serum AbAT of calves and the dams' breed, parity or serum AbAT at enrollment. No significant difference was found between the vaccine and control group for serum AbAT of cows and heifers at enrollment, days elapsed between second injection and calving, pre-suckle AbAT of calves, calf gender and days elapsed between calf birth and post-suckle serum sample.

## Significance

Following ingestion of colostrum, calves born to cows and heifers immunized twice in late gestation with a commercially available vaccine<sup>a</sup> had significantly higher serum neutralizing antibody titers to alpha toxin than calves born to control animals. The effect of passive transfer of these antibodies on calf health remains to be determined.

<sup>a</sup> *Clostridium perfringens* Type A Toxoid, Novartis Animal Health, Larchwood, IA.