

Immune response and protection of neonatal, colostrum-fed calves with modified live, intranasal, tri-valent vaccine using an experimental challenge with virulent bovine respiratory syncytial virus

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Introduction

Bovine respiratory syncytial virus (BRSV) is major viral contributor to bovine respiratory disease (BRD). BRD is a major cause of morbidity and mortality in all classes of cattle but particularly young beef and dairy calves. Passive antibodies not only help protect the calf against infection, but may interfere with the immune responses following vaccination. The objective of this study was to evaluate the efficacy and immune response of an intranasal modified live virus (MLV) trivalent vaccine in the presence of well-defined maternal passive immunity.

Materials and methods

Pooled colostrum was administered by intubation to 52 beef-dairy crossbred calves the day they were born. The calves were transported to a research facility and were randomly assigned to be sham-vaccinated intranasally with a placebo (sterile water) or vaccinated with a tri-valent (bovine herpesvirus 1, bovine parainfluenza 3 and BRSV) modified live viral (MLV) vaccine. The calves were 7-11 days old when vaccinated (Day 0) and blood and nasal secretions were collected over the next 80 days. The calves were challenged by aerosolized BRSV on Days 80 and 81 (~ 90 days of age) and clinical signs monitored, and blood, nasal swabs and nasal secretions were collected. The study was terminated on Day 88 and the animals necropsied and the lungs evaluated and sampled.

Results

Rectal temperatures were significantly higher on days 5-8 post challenge in the control group. Cumulative respiratory scores were also higher in the control group and 1 control animal died from BRSV on Day 6 post-challenge. BRSV nasal virus secretion peaked in both groups at Day 5 but the vaccinates shed 20-fold less virus. Nasal virus shed at Day 8 post challenge was near 0 in the vaccinates and 60-fold less than the controls. Lung lesion

scores (LLS) were significantly lower for vaccinated calves than those in the control group. BRSV in the lung was near 0 in the vaccinates and 80-fold less than the controls. Both groups had similar serum neutralization (SN) antibody decay until challenge. Following challenge with BRSV, the vaccinated calves demonstrated a significant anamnestic response ($P < 0.01$) on Day 88 with 14 of 24 vaccinated animals vs. 0 of 23 having increased titers. After challenge, the calves sham-vaccinated with the placebo lost weight while those vaccinated with the tri-valent MLV vaccine gained weight.

Significance

In this study, colostrum-derived antibodies did not interfere with the immune response of 1 dose of the IN MLV vaccine and the vaccine provided protection against a virulent BRSV challenge 80 days following vaccination. The IN MLV vaccine also provided systemic humoral memory.

