Efficacy afforded by the bovine respiratory syncytial virus fraction of an intranasal modified live virus vaccine INFORCE™ 3 (IBR-PI3-BRSV) in an experimental challenge model in neonatal calves

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The objective of this study was to demonstrate the efficacy of an intranasally administered modified live virus vaccine INFORCE™ 3 containing bovine rhinotracheitis (bovine herpesvirus 1), parainfluenza 3 and bovine respiratory syncytial virus (IBR - PI3 - BRSV) in seronegative calves against a virulent BRSV challenge.

Twenty-six, three- to nine-day-old Holstein calves were randomly assigned to a control group (n=10) or a vaccinated group (n=16) and vaccinated intranasally on day 0 with a single 2 mL dose of a placebo vaccine (containing IBR and PI3) and INFORCE™ 3 (IBR-PI3-BRSV) vaccine, respectively. During the vaccination phase, the two groups were housed in separate rooms, but all animals were commingled for the eight-day-long challenge phase. Calves were challenged by the aerosol route with a virulent BRSV strain, 48 or 56 days following vaccination. Efficacy was measured by comparing lung lesion scores, mortality rates and nasal shedding of BRSV between groups. Post-challenge clinical observations were performed by a clinician masked to treatment groups. Any calves that developed severe respiratory disease were humanely euthanized and all surviving calves were euthanized for necropsy on day 8 following challenge. All animal procedures were approved by ethical review for compliance with ANIMAL WELFARE guidelines. All laboratory testing during the study was performed without knowledge of assigned treatments or animal numbers.

The IBR-PI3-BRSV vaccine INFORCE™ 3 elicited a serological and mucosal viral neutralizing antibody responses to BRSV which were boosted by challenge. The BRSV challenge induced more severe lung lesion scores, mortality and virus shedding in controls compared to vaccinates. The control calves developed significantly (P≤0.0006) greater lung lesions (least squares mean of 14.0%) and experienced a significantly (P< 0.0001) higher mortality rate of 90% (9 of 10 calves) compared with 0% (0 of 16) in vaccinates, demonstrating a significant vaccine effect (P< 0.0001). Comparison of least squares mean days of BRSV shedding (controls shed BRSV for 3.8 days, whereas vaccinates shed for 1.2 days; P< 0.001) also supported a positive vaccine effect.

In conclusion, the BRSV fraction of a INFORCE™ 3 protected 3- to 9-day-old calves against virulent BRSV challenge from 48 to 56 days following vaccination by decreasing clinical signs of disease and mortality as compared to controls.