MUCOSAL IMMUNE RESPONSE OF NEWBORN HOLSTEIN CALVES FOLLOWING INTRANASAL IMMUNIZATION WITH A COMMERCIAL MULTIVALENT MODIFIED LIVE VIRAL VACCINE IN THE FACE OF MATERNAL ANTIBODY

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Introduction: In many bovine production units it is common practice to vaccinate calves within the first 90 days of life. However, to our knowledge, successful antibody production stimulated by subcutaneous or intramuscular vaccination of the colostrum-fed bovine neonate has never been documented, as those antigens are generally thought to be neutralized by maternal antibodies.

Objective: This study quantified systemic and mucosal antibody responses following intranasal vaccination of colostrum-fed newborn calves with a multivalent, modified-live viral (MLV) vaccine to demonstrate that mucosal production of IgA was not blocked by the presence of maternal antibody.

Materials and methods: Twenty-four newborn Holstein calves were fed colostrum within 12 hours of birth. Maternal antibody transfer was verified by measuring serum neutralizing titres for BHV1, BVDV1, and BVDV2. Nasal secretions and serum were collected at specified time points before and following intranasal vaccination.

Results and discussion: Maternal IgA, but no IgG1, specific for BHV-1 (gD protein), BVDV1 (E2 protein), and BVDV2 (E2 protein) was present in nasal secretions after feeding colostrum but declined rapidly within 5 days. Calves were inoculated intranasally with a commercial multivalent modified-live viral vaccine between 2-7 days of age and virus-specific IgA levels subsequently increased following vaccination. In contrast, serum neutralization titres for BHV-1, BVDV1, and BVDV2 declined steadily over time in both naïve control and vaccinated calves. No post-vaccinal leucopenia was observed. There was no detectable interferon-alpha or gamma present in nasal secretions following initial or booster vaccination.

Conclusion: These observations confirm intranasal vaccination of newborn calves, in the presence of virus neutralizing maternal antibody in serum and nasal secretions, induced a significant local IgA response but no detectable increase in serum antibody titres. Furthermore, revaccination of calves at 5 weeks of age enhanced the duration of IgA responses in the upper respiratory tract. These studies confirm the mucosal immune system in the upper respiratory tract is functional in newborn calves and intranasal vaccination is an effective strategy to avoid maternal antibody neutralization of live viral vaccines.

Keywords: IgA, intranasal vaccination, maternal antibody, modified-live viral vaccine, newborn calf