Benchmarking of the immune response induced by commercial intranasal vaccines against BRSV in dairy calves

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Objectives: BRSV is a main respiratory agent in young calves. The intranasal vaccine Rispoval® Intranasal RS+PI3 (Zoetis) is available for more than ten years and has a long history of protective effects in bovine herds. Recently three new vaccines based on the same principle became available on the European market. However little is known about the local immune response provided by this way of immunization in cattle, and if there is any difference in the priming capacity of the viral strains used in these vaccines.

Materials and methods: Cross-bred dairy calves (n=40) were allocated randomly to one of the four commercial vaccines (10/group), with equal numbers of males and females. Calves had received 4L of fresh pooled colostrum (Brix index >22) at birth, and were housed in individual hutches. At the age of 8-17 days according to the label of the summary of product characteristics, calves were vaccinated intranasally with one of the four vaccines following the manufacturer's recommendations with the indicated material and modalities for application. Blood was collected before immunization and serum BRSV-specific antibodies were assessed (Monoscreen AbELISA BRSV, BioX Diagnostics), so that titres were not known at the time of vaccine administration. Mucosal lining was collected using nasal swabs (Copan) at 0, 7, and 14 days after vaccination. Virus load was quantified by RT-qPCR (Biosellal). Local immune response was assessed by quantifying cytokine production with a Multiplex bovine cytokines assay (Milliplex, MERCK-Millipore) and by ELISA (Kingfisher Biotech).

Results: At the time of vaccination, all calves had BRSV-specific IgG1 antibodies with a mean value of 74% [43;105%] compared to the positive control of the ELISA kit. No group difference of the serum BRSV-specific antibodies of the calves before vaccination can be detected. BRSV was detected in 8/10 calves vaccinated with Rispoval® IN RS+PI3 at one of the two dates post-vaccination, but was more inconstantly detected in other vaccine groups. Cytokine concentrations were normalized to the total protein amount recovered by nasal swabing. Most of the 15 cytokines were detected in the mucosal lining and varied according to the date of sampling upon vaccination. Only trends were seen despite differences of BRSV strains, modalities of application, volume of vaccine and amount of virus administered in one or the two nostrils. Rispoval® IN RS+PI3 had a good capacity to induce Interferon gamma-induced protein 10 (IP-10 or CxCL10) production early at d7 in all calves tested.

Conclusions:With this design, no significant difference of the local immune response was noticed during a period of two weeks after vaccine application, despite some favorable trends and an homogeneous response induced by Rispoval® IN. Further data are needed to define further the difference of priming capacity among intranasal vaccines, and the consequences on the protection herewith afforded.