RAPID STIMULATION OF THE INNATE IMMUNE SYSTEM BY ADMINISTRATION OF AN ADJUVANTED, INACTIVATED VIRAL VACCINE TO ONE-WEEK OLD CALVES

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Objective: In the study reported here, we tested the ability of an oil adjuvanted, inactivated vaccine (ViraShield 6™, Novartis Animal Health US, Inc.) to induce rapid stimulation of the innate immune system in one-week old calves through use of a temporal cytokine sampling protocol.

Materials and methods: Four, one-week old Holstein steers were administered an oil-adjuvanted, inactivated viral vaccine [ViraShield 6™(VIRA)]. Blood samples and rectal temperature measurements were collected 1 h prior to treatment, hourly for the first 12 h after treatment administration and then collected at h 18, 24, 30, 36, 48, 60 and 72. Serum concentrations of interleukin 4 (IL-4), interleukin 6 (IL-6), tumor necrosis factor-alpha (TNF-α), interferon-gamma (IFN-γ), and interleukin 1 beta (IL1-β) were determined using a bovine specific ELISA assay. Cytokine levels were expressed in pg/mL as difference from baseline (samples taken immediately prior to treatment administration). Statistical analyses were performed on the baseline differences using the Student’s T-test procedures.

Results and discussion: Area under the curve analyses (hrs 0-72) for VIRA-treated calves were significant (P ≤ 0.05) for expression of increased production from baseline of IFN-γ, IL-6, IL-4, IL1-β, TNF-α, and body temperature. The AUC mean values of IFN-γ, IL-6, IL-4, IL1-β, TNF-α, and body temperature were 8.56 pg/ml, 41.59 pg/ml, 2.87 pg/ml, 12.38 pg/ml, 4.54 pg/ml, and 1.13°C, respectively.

Significant time responses were determined for each of the measured cytokine and rectal temperature.

The stimulation of the innate immune system by an adjuvanted, inactivated viral vaccine provides the basis of cellular immune system activation through stimulation of cytokines that are associated with antigen presenting cell activation, recognition of pathogen-associated microbial patterns by pattern-recognition receptors, and stimulation of a Type 1 immune pathway.

Conclusion: In this study, vaccination of neonatal calves with an oil-adjuvanted inactivated vaccine, ViraShield 6™, invoked a rapid stimulation of the innate immune system as evidenced by stimulation of cytokine production and increased body temperature in one-week old calves. The rapid stimulation of the innate immune system has clinical relevance with the inference of providing rapid, non-specific immunity for calves in the face of a disease challenge.