

Development of a field test to evaluate colostral immunity transfer in young calves

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Failure of transfer of immunity from dam's colostrum generates a negative effect on calves' health leading to increased morbidity and mortality (De Nise et al., 1989; Wittum and Perino, 1995). Unawareness of the colostral quality and variation in the calf's capability to efficiently absorb immunoglobulins (IgG) supports the need for specific evaluation of the immunity transfer at a herd level. The aim of the study was to evaluate the performances of a field test for passive immunity transfer (PIT) in calves.

Healthy calves, aged 2-6 days were investigated in beef and dairy farms in Belgium. Blood sampling were made with a 12 mL syringe and 18G needle at jugular vein. Two mL of the blood were directly added to the test tube (Calf-IgG-Test). The Calf-IgG-Test consists of a plastic tube BD-Vacutainer[®] (5 ml) containing dipotassium EDTA, a solution with 100 mg of glutaraldehyde and excipients. The tube is immediately returned 2 times to mix. Every 30 seconds, the tube is returned to see if blood has coagulated. The coagulation time is recorded. The remaining blood was transferred to plain tubes, centrifuged, the serum separated, frozen and sent to the laboratory for IgG assay by Radial Immuno Diffusion (RID). Serum total proteins (STP) were also measured using an electronic refractometer (EUROMEX[®] RD.5712). Comparisons of coagulation time (Calf-IgG-Test), STP and IgG concentration by RID (Gold-Standard) were made using contingency table. Sensitivity (Se), Specificity (Sp), negative/positive predictive value (NPV/PPV), Chi-square (X^2), Youden index (Y) and Kappa of Cohen concordance test (K) of the Calf-IgG-Test were determined. Cut-off for IgG, coagulation time and STP indicating an adequate transfer were ≥ 10.1 g/L, ≤ 1 minute and > 56 g/L, respectively. An unpaired *t*-student test was used to compare IgG, coagulation time and STP between calves with failure or correct PIT.

A total of 102 healthy calves, from 18 Belgian farms, 48 females and 54 males, 84% from beef breed, aged 5 ± 1 day (mean \pm SD), weighed 47 ± 7 kg were assayed. Among this sample, 32% of calves presented a failure of PIT. The concentration of IgG, the coagulation time (Calf-IgG-Test) and the STP in this group were 6.6 ± 2.0 g/L, 4 ± 3 minutes and 53 ± 6 g/L, respectively. For the group of calves with correct PIT, these parameters were 20.4 ± 7.4 g/L, 1 ± 1 minute and 62 ± 6 g/L, respectively. These values are significantly different ($p < 0.001$) from the other group. Compared to RID, Calf-IgG-Test had a Se of 97%, a Sp of 80%, a NPV of 98%, a PPV of 70%, a Y of 0.77, a K of 70% and a X^2 of 53 ($p < 0.001$). Assessment of PIT using STP presented a Se of 76%, a Sp of 83%, a NPV of 88%, a PPV of 68%, a Y of 0.58, a K of 57% and a X^2 of 33 ($p < 0.001$). Comparison between Calf-IgG-Test and STP indicated 58% of concordance (Kappa of Cohen).

Calf-IgG-Test principle is based on the aptitude of blood's gamma-globulins to coagulate blood while in contact with glutaraldehyde (Sandholm, 1974). In this study, 32% of calves

presented a failure of immunity transfer, which is in accordance with literature (Weaver et al., 2000). Previously, other glutaraldehyde tests were described but showed much lower performances (Tyler et al., 1993). Calf-IgG-Test presents good concordance with gold-standard and has adequate performances for a field test. It actually seems to be the most accurate and user-friendly field semi-quantitative test for the determination of PIT in calves.

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