

Determining the IgG concentrations in bovine colostrum and calf sera with a novel enzymatic assay

Marija Drikic, Claire Windeyer, Steven Olsen, Lorraine Doepel,
and Jeroen De Buck

Department of Production Animal Health, Faculty of Veterinary Medicine, University of Calgary. 3330 Hospital Dr NW Calgary AB T2N 4N1. Email: marija.drikic@ucalgary.ca

The timing, the volume and the quality of the first colostrum feed determine the transfer of passive immune defences against the diseases in newborn calves. The use of poor quality colostrum (with low immunoglobulin (IgG) concentration) leads to the failure of the transfer of passive immunity (FTPI) which results in higher morbidity and mortality rates in calves. For that reason, determining colostrum quality (CQ) and the failure of transfer of passive immunity (FTPI) on farm is of vital importance. None of the tests in use on farms currently determine IgG concentration in a direct manner. To this end, a novel detection assay, split trehalase IgG assay (STIGA), was applied to directly determine IgG concentration in dairy and beef colostrum and serum samples and to examine its potential to be developed as on-farm test. STIGA is based on trehalase (TreA), an enzyme that produces glucose, enabling the use of a common glucometer for signal measurement.

In this study, 60 dairy and 64 beef colostrum and 83 dairy and 84 beef calf sera samples were tested with STIGA, whereby the glucose production was measured and compared with the gold standard method for measuring immunoglobulin levels, radial immunodiffusion (RID). Pearson correlation coefficients between the methods were determined and the sensitivity, specificity, and accuracy of the test were calculated for different CQ and FTPI cut-off points. The correlations of the STIGA measured by colorimetric reaction compared to RID for dairy and beef colostrum were 0.57 and 0.75, respectively, whereas the correlations for dairy and beef sera were 0.72 and 0.85, respectively. Furthermore, the on-farm format of STIGA where glucose was measured by a glucometer resulted in correlations with RID of 0.7 and 0.85 for dairy and beef colostrum and 0.94 and 0.83 for dairy and beef calf serum.

Implications: The unique feature of STIGA to directly detect IgG and to produce an easily measurable output signal makes this test a promising precursor for future on-farm detection assay. STIGA is as efficient in detecting IgG levels as other devices present on the market while having the advantage of being a single step protocol applicable to different sample types (colostrum and serum).