

Research Summaries 2

Evaluation of a handheld device for the detection of β -hydroxybutyrate pre-calving in dairy cattle

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Introduction

Individual and herd ketone levels are commonly monitored in dairy cattle post-partum to identify individuals at-risk of metabolic disease and to identify potential improvements to management factors. The Precision Xtra handheld meter has been validated for use for β -hydroxybutyrate (BHBA) measurements post-calving as a convenient cow-side test for ketonemia. Recent research has identified BHBA cut points pre-partum associated with increased risk of post-partum disease, but at much lower cut-offs than those indicating hyperketonemia after calving: 0.6 to 0.8 mmol/L in comparison to 1.0 to 1.4 mmol/L. The objective of the current research is to validate the handheld device, Precision Xtra, in the measurement of BHBA in whole blood against the gold standard method, laboratory evaluation of serum, to assess its diagnostic accuracy in detecting BHBA pre-calving in the range of 0.6 to 0.8 mmol/L.

Materials and Methods

As part of a larger study, 212 cows in 6 herds across southern Ontario were sampled between 3 and 9 days prior to the expected calving date. Blood was collected and tested on-site with the Precision Xtra device. The serum portion of the sample was separated and sent to a laboratory for measurement of BHBA and non-esterified fatty acid (NEFA) concentrations. The results of the 2 BHBA measurement methods were compared and evaluated with concordance coefficients. The sensitivity and

specificity of the Precision Xtra were determined with Receiver Operator Characteristic (ROC) curves at cut points of 0.6, 0.7, and 0.8 mmol/L.

Results

The 2 tests had a moderate concordance correlation of 0.77 ± 0.03 ($CI_{95}: 0.72 - 0.83$) and the area under the curve for each cut point was high, with values between 0.90 and 0.93. The Precision Xtra had sensitivities of 85 to 93% and specificities of 76 to 87%, depending on the cut point tested. The level of agreement between Precision Xtra cut points and at-risk pre-calving NEFA concentrations of 0.4 and 0.5 mEq/L was calculated. The level of agreement between Precision Xtra BHBA concentrations ≥ 0.8 mmol/L and NEFA concentrations ≥ 0.5 mEq/L was substantial with a kappa of 0.64.

Significance

Based on the moderate level of correlation and the good level of sensitivity and specificity, the Precision Xtra is a valid tool for the detection of elevated BHBA pre-calving and may be helpful in identifying individuals at risk of metabolic disease. A convenient and cost-effective method for determining ketosis risk pre-partum will contribute to knowledge of the prevalence of elevated ketones pre-calving, the association with the risk of post-partum ketosis, and will allow for the investigation of earlier interventions.