

Exploring the use of Optium Xceed as a cow-side test to effectively diagnose Subclinical Ketosis in early lactating dairy cows.

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The nutritional requirements of high-producing milking cows in early lactation are very high. As a result, cows are often under substantial metabolic stress during the initial calving and early lactation period. Adipose tissue is metabolised to supply an alternative energy source (ketones) during periods of inadequate intake of glucose precursors. The cow in early lactation has low appetite and the energy density of diets is limited by a need to control the availability of starch and sugars in the diet. There are three ketones produced; acetoacetate, acetate and beta-hydroxybutyrate. Ketones can be utilised by certain tissues such as the heart tissue and type 1 muscle, however the pathway for utilisation is saturable. Therefore, during periods of inadequate nutrition and high energy demand, over production of ketones can occur. This can result in either subclinical or clinical ketosis. Bovine ketosis causes decreased milk production, is often associated with displaced abomasum and predisposes animals to other conditions such as mastitis and lameness (Lean 1991).

Currently available tests for detecting ketosis measure either acetoacetate or beta-hydroxybutyrate in milk, blood or urine. Subclinical ketosis has been defined as a blood beta-hydroxybutyrate concentration above 1.4mM determined using a kinetic laboratory assay (Oetzel, 2004). Conventional laboratory methods for defining subclinical and clinical ketosis are time consuming and costly, are often not available from a commercial laboratory and do not deliver an immediate result for the farmer to act upon. The development of an instant cow-side diagnostic test would greatly benefit the industry. Cow-side tests are currently being used (most commonly urine and milk tests), but there is evidence that the cut-off of 1.4mM for subclinical ketosis may not be accurate using these tests because of differences in test characteristics.

The aim of this honours project was to validate the Optium Xceed meter, a hand held human blood glucose and ketone meter. In previous studies, human blood glucose and ketone meters have been used to determine blood ketones in cows using the Precision Xtra meter, and these studies have shown high correlations between the reading given by the meter and the result obtained through laboratory testing using the kinetic assay (Iwersen, 2009)). The Precision Xtra ketone meter is currently unavailable in Australia.

The project was split into two stages. Stage 1 involved taking two blood samples and one composite milk sample from 40 early lactating Holstein Friesian multiparous cows 7 DIM (+/- 3 days). An on-farm beta-hydroxybutyrate concentration was recorded immediately after sampling using the Optium Xceed ketone meter for the blood sample and PortaBHB Milk Ketone Test for the milk sample. The remaining blood sample was transported on ice to the laboratory, centrifuged and plasma collected for future laboratory analysis. Two laboratory methods (kinetic and colorimetric assay) were then used to determine the concentration of

beta-hydroxybutyrate present. The initial results obtained from the laboratory analysis for stage one indicate a positive, strong correlation between concentrations of beta-hydroxybutyrate measured using the Optium Xceed meter and the kinetic laboratory assay.. Further statistical analyses are being performed to further explore the data.

Stage 2 involved taking a blood sample from 400 Holstein Friesian multiparous cows, 7 DIM (+/-3 days) . Concentrations of beta-hydroxybutyrate in blood were determine using the Optium Xceed meter. In both stages dietary and production data were recorded. Collection for this stage of the project is ongoing.

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