Test Comparison of Precision Xtra® and Ketostix® for Ketosis in Dairy Cows

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Introduction

Ketosis is a common disease of periparturient dairy cows. Ketosis is defined as an increased concentration of beta-hydroxybutyric acid (BHBA) in the serum. There is strong evidence that cows with mild ketonemia (above approximately 1.1-1.4mmol/l) are at an increased risk of other disease (e.g. displaced abomasum), decreased milk production and infertility. Diagnosing ketosis is important because it has a financial cost and at the herd level, reflects feeding and management. The objective of this study was to assess the accuracy of a newly available BHBA assay (Precision Xtra®), marketed for human diabetic patients, by comparison to the gold standard test. This new device has potential to be a quality cows-side test for monitoring subclinical ketosis in dairy cattle. An additional objective was to assess the accuracy of the Ketostix® test.

Materials and Methods

The study utilized 195 cows from a 3,000-cow commercial herd in Michigan in the summer of 2007. The cows were predominantly Holstein (98%), mixed parity, and 7-13 days-in-milk. Voided urine was used for the Ketostix® test (n = 150). Results were interpreted immediately after urine application. Serum was collected by coccygeal venipuncture (n = 195); a drop of fresh blood from the puncture site, needle tip, or the serum separator tube was used immediately for Precision Xtra® assay. Traditional serum chemistry was performed using the Pointe Scientific enzymatic method.

Results

Our results demonstrate that despite subjectivity of interpretation, Ketostix® are useful in distinguishing between five levels of ketonemia. Ketostix® has an accuracy of 94% when disease is defined at a level of 1.4 mmol/l, and a sensitivity of 72.7%. If disease is defined as 1.1 mmol/l, sensitivity decreases to 44.4%, and accuracy decreases to 80%. Regardless of which level is used, the test is less sensitive than Precision Xtra®. Precision Xtra® has an accuracy of 97.4% when disease is defined at a level of 1.4 mmol/l, and a sensitivity of 86.5%. If disease is defined as 1.1 mmol/l, sensitivity decreases to 80%, and accuracy decreases to 92.8%. Combined with a specificity of >99%, these describe the parameters of an excellent test. When blood BHBA concentrations by Precision Xtra® and our gold standard test were compared by linear regression, the coefficient of determination (R^2=0.96) suggested that Precision Xtra® is a valid test.

Significance

Precision Xtra® proved to be a very easy and rapid test to use, and the equipment very durable, making it ideal for use in a farm setting. This method of BHBA testing was much faster than stimulating cows to urinate. Precision Xtra® has potential uses in diagnosis of individual cow subclinical and clinical ketosis and also in herd monitoring; for example, in measuring nutritional changes and management of recently calved cows. In addition, there is potential for Precision Xtra® to be applied in other species, such as small ruminants at risk of pregnancy toxemia. This study has shown Precision Xtra® to be an accurate, fast, easy and durable test for bovine ketosis, making it great for cow-side use. Ketostix® is less accurate than Precision Xtra® because it is less sensitive. Blood collection is far more reliable than urine collection, making the Precision Xtra® an excellent, new diagnostic test.