

Investigating the within-herd prevalence and risk factors for ketosis in dairy cattle in Ontario as diagnosed by the test-day concentration of beta-hydroxybutyrate in milk

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Introduction

A large-scale observational study was conducted to estimate the within-herd prevalence and cow-level risk factors for ketosis in dairy cattle in herds that participate in a dairy herd improvement association (DHIA) program in Ontario, Canada.

Materials and Methods

Ketosis or hyperketolactia (KET) was diagnosed as milk β -hydroxybutyrate ≥ 0.15 mmol/L at first DHIA test when tested within the first 30 days-in-milk (DIM). Seven hundred and ninety-one herds, providing at least 61 first-milk tests from June 2014 to December 2015, were used to estimate the provincial within-herd prevalence of KET. All herds on DHIA in Ontario (n=3,042) were used to construct cow-level multi-level logistic regression models to investigate the association of DHIA collected variables with the odds of KET at first DHIA milk test. Primiparous and multiparous animals were modelled independently.

Results

The cow-level KET prevalence in Ontario was 21%, with an average within-herd prevalence of 21% (SD=10.6) for dairy herds enrolled in a DHIA program. The prevalence

of KET had a distinct seasonality, with the lowest prevalence occurring from July to November. Automatic milking systems (AMS) were associated with increased within-herd prevalence, as well as increased odds of KET in multiparous animals at first test (OR: 1.46; CI₉₅: 1.30 to 1.63). Jersey cattle had 1.4 times higher odds of HK than Holstein cattle. Milk yield >57.3 lb (26 kg)/d and milk fat >4.8% at the last test of the previous lactation were associated with decreased odds of KET in the current lactation (OR_{yield}: 0.55; CI₉₅: 0.52 to 0.57; OR_{fat%}: 0.83; CI₉₅: 0.79 to 0.87). Increased days dry and longer calving intervals, for multiparous animals, and older age at first calving for primiparous animals increased the odds of KET at first test.

Significance

This study confirms previous findings that increased days dry, longer calving intervals, and increased age at first calving are associated with increased odds of KET at first test. It is the first report of increased odds of KET at first test in herds with AMS and in relation to milk yield and fat percent at the final test of the previous lactation. Feeding management on AMS herds likely contributes to the increased prevalence of KET, and further work is required to investigate modifications to current management practices on AMS herds to minimize risk.

Transition management practices on Wisconsin dairies stratified by Transition Cow Index™

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Introduction

The Transition Cow Index™ (TCI) is intended to provide an objective measure of transition cow management in a dairy herd. TCI represents the difference between the

actual first-test 305-day projected milk produced by a cow and a predicted yield, which is calculated using historical information from each cow. A negative TCI indicates under-performance, whereas a positive TCI indicates that an individual cow's performance has surpassed her predicted level

of production. The objective of this study is to describe herd size, rolling herd average, prefresh and fresh pen duration of stay, as well as prefresh and fresh pen bunk space per cow on Wisconsin dairies after stratification by TCI.

Materials and Methods

From a database of 203 dairy herds located in Wisconsin, 75 Holstein herds were randomly selected to participate in the current survey. Farm owners were called by the research team to solicit participation and agree to a herd visit. During the visit, the farm representative was asked a predetermined set of questions regarding the management of far-dry, prefresh, maternity, fresh, and sick cows. Housing type, bunk space, stall surface, bedding type, and cow numbers for each pen associated with transition were documented. DHI records, including TCI and rolling herd average (RHA), were also obtained. For the purposes of this analysis, herds were stratified into 3 groups after ranking TCI by quartiles (Group A, TCI \leq 1st quartile; Group B, TCI $>$ 1st quartile \leq 3rd quartile; Group C, TCI $>$ 3rd quartile). Herd size, RHA (pounds), prefresh and fresh pen duration of stay (days), as well as prefresh and fresh pen bunk space per cow (inches) are described by medians. Spearman correlation coefficients were used to assess correlations between continuous variables. Kruskal-Wallis and Wilcoxon Rank test were used to compare medians.

Results

Forty-four herds agreed to participate, resulting in a response rate of 59% (Group A, n=18; Group B, n=14; Group C, n=12). After stratification, median TCI values for Groups A, B, and C were -224, 457 and 1,843, respectively ($P < 0.001$). Overall, TCI values were associated with RHA ($r=0.73$; $P < 0.0001$). Median herd size did not differ between groups (A: 399, B: 549, C: 481; $P = 0.84$). Median prefresh bunk space per cow (A: 27, B: 36, C: 31 inches; $P = 0.41$) and median prefresh duration of stay (A: 21, B: 21, C: 21; $P = 0.39$) did not differ between groups. Median fresh bunk space per cow (A: 24, B: 30, C: 28 inches, $P = 0.19$) and median fresh pen stay (A: 14, B: 16, C: 19 days; $P = 0.59$) did not differ between groups.

Significance

Results suggest that higher TCI values are associated with greater RHA milk production, independent of herd size. The variation in TCI from herd to herd is not entirely the result of increased prefresh and postfresh bunk space or duration of stay in the prefresh pen. Additional evaluation of management practices outlined in this survey are underway and should help our understanding of the variation in TCI at the herd level.

Rumen protected branched amino acids supplementation during early lactation in dairy cows

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Introduction

The branched-chain amino acids (BCAA; leucine, isoleucine and valine) are 3 of the essential amino acids that cannot be synthesized by dairy cattle and therefore must be provided in the feed. BCAA nutraceutical properties have been reported in humans and rodents, such as glucose homeostasis, positive regulation of amino acids (AA), and protein metabolism (Lynch and Adams, 2014). Also, BCAA accounts for up to 50% of the essential amino acids present in dairy cattle milk protein (Mackle et al, 1999). During late pregnancy and early lactation in dairy cattle, AA demand increases to support fetal development and milk protein synthesis, and a large amount of AA is withdrawn from different tissues to support gluco-

neogenesis during negative energy balance (NEB) (Kuhla, Nurnberg et al, 2011). Hyperketonemia (HYK) is one of the most common metabolic disorders during early lactation in dairy cows. Johnson (1954) and Maplesden (1954) described propylene glycol (PG) as a treatment of hyperketonemia. PG is transformed into glucose by the liver and increases insulin concentrations in blood (Vaughn et al, 1993). PG as an oral drench of 300 mL has been shown to increase milk production, decrease clinical diseases, and reduce culling in HYK cows (McArt et al, 2012). The objective of this study was to test if supplementation of Rumen Protected Branched-Chain Amino Acids (RPBCAA) with or without PG oral supplementation improved milk protein yield as well as negative energy balance during the early postpartum period in dairy cows.