Industry Presentation - Impact and Economic Evaluation of Negative Energy Balance in Transition Dairy Cattle

Jessica McArt, DVM, PhD
Cornell University, Ithaca, NY
Email: jmcart@cornell.edu

INTRODUCTION

The ability of dairy cattle to adapt to the natural change of energy balance in early lactation is an important aspect of the transition period, as the demands for milk production cannot be met by feed intake alone. In order to maintain homeorrhesis during this period of negative energy balance, cows break down adipose tissue to produce non-esterified fatty acids (**NEFA**), which are partially converted to ketone bodies (e.g. β-hydroxybutyrate; **BHB**) that can act as alternate fuel sources. Excessive production of these energy metabolites, particularly cows diagnosed with hyperketonemia (BHB ≥ 1.2 mmol/L), has been shown to have detrimental effects on immune function, milk production, and overall health. Given that 85 - 95 % of hyperketonemic cows do not show signs consistent with clinical ketosis, the health and production consequences of a poor transition into lactation are often unseen.

MANAGING THE TRANSITION PROCESS

Individual Animal Diagnosis and Treatment

Use cow-side blood BHB meters to diagnose hyperketonemia as they are more accurate than urine or milk tests. Cows with hyperketonemia have blood BHB concentrations ≥ 1.2 mmol/L.

- Drench hyperketonemic cows with 300 mL of propylene glycol **(PG)** once/d for 3 - 5 d.
- Give one dose of vitamin B12 at the start of propylene glycol treatment.
- For cows with more severe hyperketonemia (BHB ≥ 3.0 mmol/L), administer ½ - 1 bottle of dextrose intravenously.
- Use of glucocorticoids (e.g. dexamethasone) are equivocal and may be detrimental to cows with BHB > 2.0 mmol/L.

Costs Associated with a Case of Hyperketonemia

The cost of hyperketonemia includes not only treatment costs. Multiple studies have shown that the risk of metritis, displaced abomasum, and early lactation culling are increased for hyperketonemic animals. In addition, reproductive performance to first service suffers and there is a decrease in milk production in early lactation.

- The average total cost per case of hyperketonemia is $289.
- Cost per 1,000 calvings in a herd with a 30 % incidence of hyperketonemia is approximately $86,500.

Herd-level Monitoring and Treatment

To determine how much ketosis is in your herd, sample about 20 cows from 3 - 16 DIM to estimate your herd prevalence. This is a snapshot of your herd, and some cows may have already had ketosis and recovered or will go on to develop ketosis; thus the actual number of cows experiencing hyperketonemia during this period will be

approximately 2 times your prevalence. For example, if you test 20 cows and 5 are hyperketonemic, your prevalence is 25 %; however it is likely that 10 of these 20 cows will have BHB ≥ 1.2 mmol/L at least once from 3 - 16 DIM (i.e. 50 % incidence).

- If herd prevalence is ≤ 15 %, continue to monitor the herd-level prevalence monthly.
- If herd prevalence is > 15 to 40 %, sample cows 3 - 9 DIM twice weekly for improved treatment response.
- If herd prevalence is ≥ 40 %, consider blanket treatment with PG starting at 3 DIM.

Repeated prevalence testing is recommended in order to evaluate changes in transition cow management and allow appropriate adjustment of farm hyperketonemia testing and treatment protocols. For a herd with a 20 % prevalence of hyperketonemia that freshens 1,000 cows/yr, choosing to test cows 2 d/wk and treating the positives will return a benefit of $10,000 to $25,000/yr.

Prevention of Hyperketonemia

Remember*, the goal is to not treat many, if any, cows with PG, but rather have transition cow management strategies in place such that the prevalence of hyperketonemia is lower than 10 %*. Decreasing the prevalence of hyperketonemia from 20 % to 10 % will save almost $60,000 across 1,000 calvings. Preventative management strategies include, but are not limited to:

- Feeding a controlled energy diet during the dry period,
- Feeding rumen protected choline and monensin throughout the transition period,
- Minimizing the stocking density of pens and pen moves before arrival in the maternity pen,
- Housing fresh heifers separate from cows,
- Maintaining a fresh pen stocking density < 85 %, and
- Maximizing cow comfort.

CONCLUSIONS

Excessive negative energy balance in early lactation is an issue in many dairy herds. As most cases of hyperketonemia are subclinical in nature, associated disease events, early removal from the herd, and production losses are often unrecognized economically. Individual and herd-level testing should focus on the first week to two weeks of lactation in order to optimize individual animal treatment and herd management practices. Although testing and treatment of hyperketonemia is economically beneficial, nutritional and management strategies to prevent hyperketonemia should be the goal.

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