Manage, monitor metabolic ‘Armageddon’ in transition cows

Sabine Mann, Jessica McArt and Daryl Nydam for Progressive Dairyman

Dairy cows experience a state of negative energy balance (NEB) during the transition from pregnancy to lactation when the energy demand of milk production cannot be met by feed intake alone. The drop in dry matter intake around the time of calving leads to insufficient amounts of protein intake and available blood sugar needed for the production of milk protein and lactose.

This leads to a catabolic state, meaning that adipose and muscle tissue are broken down to fill these metabolic needs, and is usually noted in a rapid loss of body condition postpartum. This is particularly prominent in cows that undergo excessive NEB in early lactation and that have an increase in the blood concentrations of markers of NEB such as the ketone body beta-hydroxybutyrate (BHB) from liver metabolism and non-esterified fatty acids (NEFA) originating from adipose tissue mobilization.

A number of epidemiological studies, including those recently carried out at Cornell, have shown an increased risk for negative health events and production outcomes associated with this increase in markers of NEB. Due to the practicality of cowside testing for BHB, data are readily available on risks associated with hyperketonemia (defined as blood BHB concentrations of 1.2 mmol per L or greater). These include a higher risk for displaced abomasum and removal from the herd, a loss in milk production and a decrease in reproductive success.

Our research showed that these events of hyperketonemia happen most often for the first time within the first four or five days after calving. Other studies have shown that the negative health outcomes for this early time were far more severe than when cows became hyperketonemic later in lactation (e.g., after the first week).

In addition, our recent economic analysis confirmed that hyperketonemia is a costly disease with a component cost per case of $134 and $111 for primiparous and multiparous animals, respectively. This increased to $375 and $256 per case for primiparous and multiparous animals, respectively, when accounting for costs of diseases that are attributable to hyperketonemia, such as metritis and displaced abomasum. On average, a case of hyperketonemia costs $290, and at a typical herd incidence of 40 percent, that multiplies to an unfortunately big number.

This led us to ask the following question: Why do some cows experience a more severe NEB, and why is the proportion of such cows higher in some herds than in others? The knowledge about the epidemiology and time point of these metabolic disorders so close to calving point to the dry period as a potential contributor and opportunity for prevention of this catabolic “Armageddon.”

In fact, our research showed that cows overfed energy in the dry period had higher concentrations of both BHB and NEFA in the immediate postpartum period. Cows overfed energy in excess of predicted requirements (larger amount of corn silage and smaller amount of chopped straw compared to the controlled energy group) by approximately 50 percent had almost three times as many episodes of hyperketonemia in the first three weeks postpartum (31 versus 13) compared with cows that were fed to meet, but not exceed, energy requirements (with about 16 percent starch in the diet).

These results were based on 28 cows in each group tested three times per week. Moreover, a more severe increase in BHB concentrations (above 2.5 mmol per L) was absent in the controlled energy group, whereas four cows had to be treated for clinical disease in the overfed group. All cows in this trial were fed equal amounts of metabolizable protein during the dry period in order to ensure that protein availability would not contribute to observed differences.

Based on this and other similar studies, one reason why some herds experience a higher risk for metabolic derailment may therefore be the energy cows receive during the dry period with an increased risk for those cows overfed energy before calving. Other management factors certainly involved
in the observed differences between farms and that could lead to an increased risk for excessive NEB early in lactation include inadequate cow comfort, high stocking density (e.g., higher than 80 percent in the close-up and fresh group), a large number of pen moves, inadequate heat abatement and limited access to water.

Having high-quality feed available at least 23 hours of the day, as well as management programs in place for the prevention of infectious diseases such as mastitis and uterine infection, aids in the decrease of the risk for this metabolic derailment. Mature cows, cows that had a difficult calving and those calving overconditioned are generally at an increased risk to develop hyperketonemia at the beginning of lactation.

In order to know if your herd is affected by the economic cost of hyperketonemia, the prevalence of this metabolic disorder needs to be established first. We recommend monitoring animals between three and 14 days in milk to establish a herd prevalence level because this time frame accounts for the highest risk period to develop hyperketonemia and also to have negative health events associated with the event. Note that about 85 to 95 percent of cows affected with hyperketonemia will never show clinical signs consistent with the disorder.

The ability of detecting ketosis by smelling the breath of cows is highly user-dependent and does not allow for a quantification of ketosis, even if it is correctly diagnosed by the observer. Therefore, monitoring your herd based on observation and smell is highly inaccurate and discouraged. The most accurate testing method uses the blood concentration of BHB and can be carried out cowside with a number of different meters. Urine- and milk-based tests are also commonly used for the detection of hyperketonemia, but their ability to detect all cows that are truly affected is more limited compared with blood-based tests (false negative cows will occur at a higher rate), and their use for monitoring programs is therefore not generally recommended.

Monitoring herd-level prevalence differs from detecting all cows that may be suffering from hyperketonemia, as it is sufficient to test 20 to 24 cows three to 14 days in milk at random. If your herd has more than 24 cows in this time frame, it is recommended to get a list of all eligible cows and randomly select up to 24 animals from that list. Cherry-picking cows for testing (e.g., those that look particularly unhealthy or those that are conveniently found in the headlock) needs to be avoided, as it will lead to false representation of the true prevalence. Testing of cows that have already been treated should also be avoided. Ideally, monitoring should be integrated into the fresh cow program so that time spent in headlocks is minimized (less than one hour per day).

What should you do once you have obtained those results? Individual cows sampled and found positive for hyperketonemia will benefit from treatment as our research has shown, improving the time to resolution of hyperketonemia and decreasing the risk for displaced abomasum and removal from the herd. For mild cases of hyperketonemia (e.g., BHB less than 2.5 mmol per L), we recommend oral drenching with 10 ounces of propylene glycol once daily for three to five days. More severe cases of hyperketonemia may benefit from a single infusion of intravenous dextrose (250 to 500 cc of 50 percent dextrose) in addition to propylene glycol.

Next, you need to calculate the herd prevalence as the number of positive animals to number of cows sampled and found positive for hyperketonemia will never show clinical signs consistent with the disorder. The herd prevalence on a monthly basis, as this is the lowest-risk category, and to only treat those animals found positive during monitoring.

If your herd level prevalence is between 16 and 40 percent (medium-risk category), we recommend that all cows between three and nine days in milk should be sampled twice a week, and those cows identified as positive should be treated to avoid negative health and production consequences as outlined above.

If your herd level prevalence is higher than 40 percent, treating all animals without testing starting at three days in milk for five days with a propylene glycol drench once daily is more economical than testing individual cows.

If you are in the medium- and high-risk category, we recommend you work with your veterinarian and nutritionist toward reducing your herd prevalence, taking all the possible contributing factors that may apply to your specific situation into account.

The group of authors – Sabine Mann, DVM, Ph.D., and Daryl Nydam, DVM, Ph.D. – are part of the faculty at Cornell University.

Order yours today at www.progressivepublish.com/hats