The cost of subclinical ketosis

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Negative energy balance (NEB) occurs in early lactation dairy cattle when the energy they need for milk production exceeds the amount available through feed intake. To have more energy, these cows break down fat stores to produce non-esterified fatty acids (NEFA) and ketone bodies (e.g., beta-hydroxybutyrate, BHBA), which act as alternate fuel sources. An elevation of blood NEFA and BHBA is normal during this time in order for cows to adapt to the physiologic changes that occur from late gestation through early lactation; however, cows that have a poor adaptive response to NEB will produce excessive NEFA and BHBA.

This excessive production, particularly in cows with hyperketonemia (a blood BHBA concentration of 1.2 mmol per L or more, i.e., subclinical and clinical ketosis), has been shown to have detrimental effects on immune function, milk production and overall health of these cows. The incidence of hyperketonemia in many dairy herds during the first two weeks of lactation has been reported to range from 40 to 60 percent. Given that 85 to 95 percent 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, as are the lost economic opportunities.

Our current research at Cornell University, in collaboration with Dr. Mike Overton at Elanco, describes the development of a model that estimates the economic costs of hyperketonemia. The cost of hyperketonemia was modeled to look both at the direct consequences of the impact of this disease on milk production, treatment and culling (referred to as the component cost), as well as the total cost of hyperketonemia, which is the sum of the component cost and additional disease-attributable costs associated with hyperketonemia (namely metritis and displaced abomasum or DA).

The idea of a total cost of hyperketonemia was developed because cows with hyperketonemia are much more likely to develop metritis and DA; thus, those costs need to be included to fully understand the impact of hyperketonemia. Modeling was based on the incidence of disease in primiparous and multiparous animals, the cost of diagnostics, therapeutics, veterinary service, labor, death loss, future milk production losses, future culling losses and reproduction losses.

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Photo by PD staff.
The component cost per case of hyperketonemia was estimated at $134 and $111 for primiparous and multiparous animals, respectively, with the average estimated to be $117. Thirty-four percent of the component cost of hyperketonemia was due to future reproductive losses, 26 percent to death loss, 26 percent to future milk production losses, 8 percent to future culling losses, 3 percent to therapeutics, 2 percent to labor and 1 percent to diagnostics. Given that future reproductive losses, future milk production losses and future culling losses are not tangible costs to producers, almost 70 percent of the cost of hyperketonemia is likely overlooked.

The total cost per case of hyperketonemia, when including costs attributable to metritis and DA, was estimated at $375 and $256 for primiparous and multiparous animals, respectively, with the average estimated to be $289. Forty-one percent of the total cost of hyperketonemia was due to the component cost of hyperketonemia, 33 percent to costs attributable to metritis and 26 percent to costs attributable to DA.

Given an average total cost of $289 per case of hyperketonemia, a herd with 1,000 calvings a year and a 30 percent incidence of hyperketonemia will lose approximately $90,000 due to the disease. This loss reinforces the importance of appropriate transition cow nutrition and management in order to decrease the incidence of hyperketonemia.

For example, if the herd mentioned above is able to improve management strategies and decrease the incidence of hyperketonemia in their herd to 15 percent, they will save almost $50,000 a year. Alternatively stated, if this producer makes $50,000 of changes to improve transition cow management and comfort that decrease the incidence of hyperketonemia to 15 percent, this cost will be recuperated in only one year.

Before determining the economic impact of hyperketonemia on any given herd, it is first necessary to determine the amount of hyperketonemia in the herd. Easy, accurate and relatively inexpensive, cow-side testing can be accomplished using the Precision Xtra Meter. The meter can be purchased online for $20 to $40, and BHBA test strips can be purchased through a veterinarian and cost approximately $2 a test. The test requires only a couple of drops of blood most easily taken from tail vessels.

Two types of measurements can be used to estimate the amount of hyperketonemia in a herd: incidence or prevalence. Incidence refers to new and existing cases and requires just one test of a set of animals. Prevalence refers to the number of new and existing cases and requires repeated testing of a set of animals to see if they develop hyperketonemia. Previous studies by researchers at Cornell and the University of Wisconsin have shown that the incidence of hyperketonemia can be estimated in a herd by testing animals at least twice a week from three to 16 days in milk.

For example, a herd could choose to follow 50 fresh cows and test them each twice a week for their first two weeks of lactation to see how many develop hyperketonemia. The incidence is then calculated by the number of cows that have tested positive for hyperketonemia at least once, divided by the total number of cows tested. In this example, if 20 cows tested positive (blood BHBA of 1.2 mmol per L or more) at least once, the herd incidence would be 40 percent (20 out of 50).

Prevalence refers to the number of new and existing cases and requires just one test of a set of animals. Studies from the University of Guelph and Cornell have shown that the incidence of hyperketonemia is approximately twice the prevalence. For example, a herd could choose to test 50 animals at one time that are between 3 and 16 days in milk. If 10 of those animals were hyperketonemic, the prevalence of hyperketonemia in the herd could then be estimated to be 40 percent (2 x 20 percent).

As with most diseases, the goal of any testing and treatment or management strategy for hyperketonemia is to optimize the economic return while improving the health and well-being of our dairy cows. Given the potentially large negative financial impact of hyperketonemia, the return on investment in sound treatment of cows and management of the herd is likely to be positive.

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