

# Keeping Up With Ketosis

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This July, researchers and industry individuals gathered to exchange information and ideas in Orlando, Florida at the 2015 Joint Annual Meeting (JAM) of the American Dairy Science Association and the American Society of Animal Science. Some highlights of presentations focused on ketosis detection and research results are provided below. Interest in early disease detection has increased with the availability of precision dairy technologies.

## **Ketosis detection:**

Researchers from the University of Guelph presented several studies on the potential for predicting subclinical ketosis. One study compared lying time of healthy cows to cows with subclinical ketosis, and cows with subclinical ketosis and at least one other disease. No lying time differences were identified for 1<sup>st</sup> lactation cows. The only differences reported were for cows with 2 or more lactations following calving. Subclinically ketotic cows and cows with more than one disease spent 38 to 92 minutes/day more lying down than healthy cows. A counterpart to the first study compared rumination time (SCR Engineers) of healthy cows to the same groups. The differences in rumination occurred before and after calving in cows with 2 or more lactations. The largest differences were between cows with more than one disease and healthy cows, ranging from 48 to 73 minutes/day less rumination time compared to healthy cows. The information from these two studies suggests using either lying time or rumination time in cows with 2 or more lactations may be a way to monitor subclinical ketosis, although the results did not carry over for first lactation animals.

Another group of researchers focused on milk components instead of wearable technologies to predict subclinical ketosis. Canadian researchers explored the effectiveness of Herd Navigator's (DeLaval) in-line milk testing technology. This technology measures  $\beta$ -hydroxybutyrate, an indicator of ketosis, automatically through milk. Researchers noted that in  $\geq 3$  lactation cows, animals with subclinical ketosis had higher milk production than animals with mild subclinical ketosis or healthy animals. The ability to detect  $\beta$ -hydroxybutyrate levels within the milk coupled with milk production records may be used to determine when animals need to be treated for subclinical or clinical ketosis. Wisconsin researchers approached prediction in a different manner. They compared milk and blood  $\beta$ -hydroxybutyrate levels to variables collected from test day information. This particular study used Dairy Comp305, but the variables would be available in other herd management software. The model developed by Wisconsin researchers noted the highest risk for subclinical ketosis occurred between 5 to 8 days in milk. Using lactation number, previous lactation length and days dry, age at first calving, parity, days in milk, fat and protein ratio, and milk yield on test day, the model could predict ketosis with 83 to 88% accuracy in  $\geq 2$  lactation cows, and 96 to 97% accuracy in first lactation cows.

*Take home message:* Wearable technologies, in-line measurements, and models all have potential to predict or identify subclinical ketosis incidence. However, only the Wisconsin model was successful at predicting subclinical ketosis incidence in first lactation cows.

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**Ketosis effects, treatment, and cost:**

Although several researchers focused on novel detection techniques, some focused on effects of ketosis on production, the treatment of ketosis, and the overall economic and environmental repercussions of ketosis.

Canadian researchers studied the effect of ketosis on milk production within the first 63 days in milk. Unlike the results from the Herd Navigator study, increases in  $\beta$ -hydroxybutyrate coincided with lower milk yield. Over the 5 herds, increased milk yield in ketotic cows was short lived (first week of lactation). However, the change in milk yield between ketotic and healthy cows varied between farms from no difference to 16 lbs/day less in ketotic cows. This may indicate that the level where treatment is required differs by farm, and should be included in protocol decisions.

A common treatment for ketosis is propylene glycol. Researchers from The Ohio State University tested the effectiveness of treating subclinical or clinical ketosis with direct administration of propylene glycol and dextrose. Cows with subclinical ketosis that were treated reduced severity of subclinical ketosis and increased in body condition and milk yield. California researchers explored a different treatment approach through niacin feeding to fresh cows. When cows were fed 3.5 g/d of ruminally protected niacin from 1 to 22 days in milk, dry matter intake increased from 42 to 47 lbs/d and ketosis prevalence declined from 36 to 20%. Both of these studies indicate that therapeutic and preventative treatments of ketosis reduce ketosis prevalence and improve production.

The cost of transition cow diseases are not always easy to measure. Dutch researchers from Wageningen University modeled the cost and the global warming potential from subclinical ketosis cases. Cows with ketosis were at risk for other diseases resulting in lower milk yield, lost milk from treatment, a greater calving interval, and increased risk of culling. The results from the model suggested a case of ketosis costs the producer \$36 to \$60. Ketosis also resulted in a 1 to 2% increase in carbon emissions per unit of milk. More research is needed to determine the cost and benefit of treating ketosis at the onset of the disease, or preventative treatment.

*Take home message:* Ketosis is a costly disease that can lead to more transition cow diseases. Ketosis and the increased risk of other diseases results in decreases in milk production and dry matter intake. Preventative treatment with low levels of niacin or treatment at disease onset with propylene glycol are both effective at improving milk production and decreasing negative energy balance.