

Ketosis:

Early detection can prevent costly losses

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If not managed correctly, dairy cows in transition from pregnancy to lactation will not be able to meet their energy requirements for maintenance and milk production through diet alone. Without adequate feed intake, transition cows will begin mobilizing excessive fat, entering into a state of negative energy balance and producing ketones as an alternative energy source. This is a state we call ketosis. If left untreated, ketosis can negatively impact milk production and is associated with a higher incidence of displaced abomasum, retained placenta, mastitis, infertility and early culling. Researchers from Cornell University have estimated the total cost of one ketosis case, including both treatment and disease-attributable expenses, to be \$289 per cow.¹

Early detection and intervention are obviously critical for preventing major losses, but the vast majority of ketosis cases are subclinical, meaning there are no overt signs of disease. Fortunately, a number of tests are available to help producers identify ketotic cows, as well as monitor the overall prevalence of ketosis in the milking herd. The availability of cowside tests and on-farm milk component analysis tools now make it easier than ever to detect ketosis.

Blood tests

The predominant ketone in cows is beta-hydroxybutyrate (BHBA); others include acetoacetate (AcAc) and acetone. Laboratory measurement of BHBA is considered “the gold standard” for ketone testing, but does not allow for immediate action as there is a wait to get results. Ketone strips designed for use with a human glucometer can be used cowside to measure BHBA levels in blood taken from the tail vein. An animal testing at or above 1.4 mmol/L BHBA is considered to be positive for subclinical ketosis.² Blood testing using human ketone strips is highly accurate, but still requires manual labor and can produce additional stress for postpartum animals. In recent months, these strips have been difficult to obtain due to backorders.

Urine tests

Urine tests are designed to measure concentrations of AcAc and acetone, which are lower than blood BHBA in both sensitivity and specificity. Some tests require interpretation immediately (within 5-10 seconds) after contact with urine, or they become unreliable. These tests are generally not useful for monitoring pro-

grams as producers often fail to obtain enough samples to be representative of the herd. Urine testing can also be inconvenient and expensive for owners of large herds. A reading of “Small” (15 gm/dL) with a device like Ketostix is considered indicative of subclinical ketosis.³

Milk tests

Milk tests are available that measure AcAc and acetone, as well as BHBA. At least one university researcher has called AcAc and acetone milk tests “essentially useless” due to poor sensitivity. Like cowside urine tests, strips used to measure BHBA in milk are lower than blood BHBA in both sensitivity and specificity. A cow testing at or above 100 μ mol/L BHBA in milk is considered positive for subclinical ketosis.⁴ Like all cowside strip tests, milk ketosis tests can be costly for large herds; if samples are taken in the parlor, they may also slow down milking.

Milk component analysis

Several researchers have noted the usefulness of milk fat-to-protein ratio (F:P) as a possible indicator of ketosis.^{5,6} An elevated F:P has been associated with an increased risk for ketosis, retained placenta, displaced abomasum, metritis and endometritis.^{7,8} Although herd F:P is available from DHI tests, these tests only occur every 30-40 days, and cows less than 10-15 DIM (the most likely to have ketosis) are not tested.

Newer tools include inline devices with photoelectric sensors capable of automatically measuring milk components (fat, protein and lactose) in every pulse, for each cow, in real time as the cow is being milked. Such devices allow the herd manager to instantly identify and treat ketotic cows based on continuous, daily monitoring of F:P values. Additionally, ruminal acidosis, mastitis, low-fat syndrome and even simple indigestion are all health problems that can be readily identified and addressed using on-farm milk composition analysis tools.



Inline devices for milk component analysis are a valuable tool for detecting ketosis and other metabolic conditions.

Cows in transition can be successfully managed through diet, but early detection of ketosis remains your best management practice for preventing costly milk loss and treatment. Ask your veterinarian which ketosis testing method is right for your operation. Unless you have a constant sampling method, such as the inline systems, you will need to establish a testing protocol to determine which cows get sampled when, to increase the likelihood of detecting subclinical ketosis in your herd.

1. McArt, J.A.A., D.V. Nydam. The cost of subclinical ketosis. *Progressive Dairyman*. 22:40-41.

2. Duffield, T.F. Is there a best way to monitor ketosis? *Hoard's Dairyman*. 100510_344. Retrieved October 20, 2015 from http://www.hoards.com/E_nutrition/nu10

3. *Ibid.*

4. *Ibid.*

5. *Ibid.*

6. Duffield, T.F., D.F. Kelton, K.E. Leslie, K.D. Lissimore and J.H. Lumsden. 1997. Use of test day milk fat and milk protein to detect subclinical ketosis in dairy cattle in Ontario. *Can. Vet. J.* 38:713-718.

7. *Ibid.*

8. Heur, C., Y.H. Schukken and P. Dobbelaar. 1999. Postpartum body condition score and results from the first test day milk as predictors of disease, fertility, yield and culling commercial dairy herds. *J. Dairy Sci.* 82:295-304.