Metabolic Diseases of Dairy Cattle - Ketosis

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Ketosis or acetonemia is a common metabolic disease of lactating cows occurring during the first 10 to 60 days after calving in high-producing cows. The three-week period after calving seems to be the most critical time. The disease results from a lowered blood sugar in the circulating blood which causes the formation and release of ketone bodies. Ketone bodies (specifically acetone) are volatilized and account for the "sweetish" smell detectable on the breath, and in the milk or urine of affected cows.

Symptoms of ketosis in dairy cattle include dullness, depression, a staring expression, rapid loss of weight, a drop in milk production, constipation, mucus covered feces, incoordination and partial paralysis. A few cows may become highly excitable. Breathing is shallow with an acetone smell in the breath. Cows will usually consume hay, straw or other roughage but generally refuse grain or concentrates. About two-thirds of the cases are primary or uncomplicated ketosis. The other third are secondary cases, complicated by such things as retained placenta, metritis, displaced abomasum, nephritis, hardware or the other problems causing cows to go off-feed. An elevated temperature may indicate that other factors are involved.

**RUMEN FATTY ACIDS**

Since ketosis is only a practical problem in ruminants, changes in the rumen have been investigated. Fatty acids (acetic, propionic and butyric) arising from microbial rumen fermentation furnish from 40 to 70 percent of a ruminant animal's energy requirements. Of these acids, propionic is by far most vital to the prevention of ketosis, and high energy rations favor propionate production. An increase in butyric acid would be undesirable since this acid is a potential source of ketone bodies.

Other suggestions for the prevention of ketosis include the addition of sodium propionate and propylene glycol to the dairy ration. Generally, the response to either system is slow and treatment must be extended over a period of time. Sodium propionate creates a palatability problem whereas propylene glycol is completely palatable. USDA researchers report that twice daily feeding of 4 ounces of propylene glycol, beginning 14 days prior to the anticipated calving date and continued for 7 weeks postpartum, reduced the incidence of ketosis by 18 percent.

Recent university studies at Kansas State and New Hampshire showed a reduction in ketosis when cows received rations supplemented with 6 grams of niacin daily before calving. Blood ketone and nonesterified fatty acid levels were lower and blood glucose concentrations were higher in niacin-supplemented cows.

The ketone test is a simple diagnostic tool for determining the presence of ketone bodies and is used by veterinarians and is also available to dairymen. The test is used for determining the presence of acetone in milk and urine. Colostrum milk does not give accurate results. The urine test shows positive results before the milk test does. Even so, do not be concerned until a positive test is obtained from milk. The blood level of ketone bodies is the best test for determining the degree of ketosis.

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TREATMENT

Most accepted ketosis treatments attempt to increase blood sugar levels. Usually, about 500 ml of a 50 percent glucose solution is used. When this is the sole treatment, relapses are frequent. As a result, most veterinarians recommend intravenous injection of glucose with the incorporation of insulin as a part of the therapy. Also, some veterinarians supplement corticosteroids for a few days following treatment to boost blood glucose levels.

Despite increasing milk production in recent years, there has been a gradual decline in cases of ketosis, perhaps because of improved feeding practices during the dry period and a greater understanding of the disease. Several suggestions for preventing ketosis follow.

HIGH RISK GROUPS

The incidence of ketosis is higher in older cows and high-producing cows. As cows produce milk, they become more susceptible. Ketosis has not been a problem in most Florida herds but does occur frequently in some.

Preventive measures include the use of well balanced rations three to four weeks prior to calving, with the energy content increased substantially after the cow freshens. Heavy springers and fresh cows should have adequate amounts of long roughage. Avoid abrupt changes in the overall ration at or near the time of calving in order to keep stress at a minimum. Free choice feeds such as molasses should not be fed to heavy springers because of possible changes in the microbial population.

Body tissue is used for milk production with relatively high efficiency, and moderate weight loss in early lactation appears to have no harmful effects. On the other hand, excessive weight loss appears to make a cow more susceptible to ketosis, and should be avoided. A high quality diet relatively early in lactation can be attained by a good group feeding program after calving. This is an effective means of holding weight loss to a minimum and also for attaining high peak production and greater lactation yield. Peak feed intake, however, will not be reached until 10 to 12 weeks after calving.

Cows that have adjusted to the herd ration two to three weeks prior to freshening may be placed in a moderately high group for free choice feeding following parturition. Group feeding according to production or stage of lactation has been shown to be practical. This practice offers the distinct advantage of placing cows with similar nutritional requirements in groups for more efficient and effective feeding. Thus, cows with similar requirements can be fed and managed as a unit.

1. Overconditioned or fat cows are more susceptible to ketosis. Maintain cows in good condition during the dry period. Condition scoring of cattle may be a useful tool in monitoring body condition.
2. Avoid abrupt changes in the feeding program at calving time.
3. Provide properly balanced rations for heavy springers with increasing amounts of a high energy diet after calving.
4. Provide adequate amounts of good quality roughage when practical.
5. Avoid feeding large amounts of silage to heavy springers.
6. Provide an environment for heavy springers and fresh cows that is comfortable and stimulates appetite.

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.