

# Texas Dairy Matters

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## KETOSIS IN DAIRY COWS

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The postpartum period is a critical stage of lactation for a high producing dairy cow. This period is characterized by drastic metabolic changes, immunosuppression, negative energy balance (NEB) and elevated levels of stress, which can lead to increased incidence of diseases and decreased animal efficiency. Ketosis is one metabolic disease, frequently observed in high producing herds.

Ketosis usually occurs within a few days to a few weeks after calving. It is characterized by low blood glucose, excess ketone bodies in blood and urine, lack of appetite, either lethargy or excitability, weight loss, depressed milk production and occasionally, in cases of severe ketosis,



incoordination and neurologic signs. Based on various reports, the incidence of clinical ketosis can range from 2 to 15% and subclinical ketosis from 9 to 34 %.

Any factor resulting in a reduction of dry matter intake (DMI) increases the risk for ketosis. Around calving, lactating dairy cows naturally decrease DMI due to the advanced stage of gestation, as well as metabolic changes which occur in this period. This decrease in DMI typically leads to NEB. During the last week of fetal

development, the fetus uses approximately 46 % of maternal glucose. The onset of milk production makes this energy shortage even more remarkable.

When lactation starts, the mammary gland requires a large amount of glucose for lactose milk synthesis. It is estimated that the mammary gland consumes 60 to 70 % of the whole body

glucose, mainly for lactose synthesis. In this case, a cow producing 66 pounds of milk per day uses at least 3.3 pounds of blood glucose to synthesize milk lactose. The high energy demand during this period of glucose shortage triggers a compensatory process of nutrient partitioning and fat mobilization. During this period of glucose shortage, fat is mobilized as an alternative source of energy. It is used as a fuel for basic cell functions in addition to providing energy to maintain milk production. In the process, ketone bodies are produced and the excess are eliminated in the urine and milk.

Several studies have described deleterious effects of ketosis on animal health and reproduction. Clinical ketosis is associated with an increase of 2 to 3 days to first service and a 4 to 10 % reduction in pregnancies per AI at first service. Other researchers have identified an association between ketosis and an increased incidence of ovarian cyst. Body condition score (BCS) has been linked to metabolic changes during the postpartum period. An elevated BCS at calving is a major risk factor for ketosis. Cows with elevated BCS at calving (BCS  $\geq$  4.0) had elevated levels of circulating ketone bodies in plasma. They were at the highest risk of developing clinical and subclinical ketosis compared to cows classified as either a moderate or thin BCS prior to calving.

Ketosis is an undesirable disease with a severe impact on animal performance and consequently on the economic well-being of dairies. Prevention usually is less costly than treatment associated with production losses. Due to the increased energy demand required before calving, strategies to prevent metabolic diseases must focus on the nutritional management of the dry and transition cow. The goals of these diets are to provide all required nutrients and to adapt the rumen for future diet changes as cows advance through these lactation stages. To prevent metabolic disorder, diets must be properly formulated to accomplish this goal and to minimize DMI reduction. Managing BCS towards the end of the previous lactation is an important management practice to minimize ketosis and other postpartum metabolic diseases.

<http://texasdairymatters.org>

May, 2010

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