

MEDICINE AND MANAGEMENT

By CARL TROOP, VMD



Ketosis is basically an energy problem

Milk fever and ketosis (acetonemia) are the two most important non-infectious diseases of dairy cattle, and both are influenced to a large degree by the feeding program. Milk fever was discussed in a previous column; this one will try to establish a basic understanding of ketosis, to build a foundation for future columns on developing a practical feeding program.

Ketosis is a very complex problem; one which has many forms, multiple causes, variable and not always con-

sistent signs, and unpredictable response to treatment. Any attempt to simplify a description of such a complex condition will require omission of a great deal of technical and otherwise pertinent information, but in the interest of understanding and practicality we will try to do so.

Acetonemia and ketosis are, for all practical purposes, just two different names for the very same conditions. It occurs worldwide and has long been a major problem of dairy cows. Incidence per herd varies widely, ranging from two to 20 per cent. Most of the cases occur between one and six weeks post-calving, usually in the peak milk producing years, although it can occur in first calf heifers and older cows.

Clinical signs vary, the most predominant one usually first noticed of just being "off feed". Behavior changes can occur early or late in the course of the disease, some being so slight that only a farmer very familiar with the individual cow is likely to notice them, while others may be so extreme as to become uncoordinated or ramble and charge without regard for obstacles or people in their path. Between these extremes are excessive salivation and constant licking or chewing on objects. One client's cow was chewing so vigorously on the water pipes and water bowl he wasn't sure which he should call first, the plumber or the veterinarian. Depression of milk production is usually slight at first, but later may become quite severe. There is also a characteristic odor to the milk and breath, an odor much like acetone.

Ketosis is basically an energy problem. A cow requires a certain amount of energy, primarily glucose or blood sugar. Normal blood levels of glucose are about 40 to 50

mg. per cent. Ketotic cows can have as little as half that much. A 1200 pound cow will require about four pounds of glucose per day just for normal body functions. If she is milking about 50 pounds per day, requirements are about six pounds of glucose. A cow milking 100 pounds per day is going to require over eight pounds of glucose, much of which is converted into lactose in the milk. It is easy to see why a cow is very susceptible to an energy imbalance at the time of peak lactation.

Although glucose is the major energy supply in the blood, just the lack of glucose itself does not produce all the signs or conditions of acetonemia.

There are also substances in the bloodstream known as ketone bodies or just ketones. They are a perfectly normal substance and are used by many tissues, the blood level usually ranging about two to four mg per cent. The ketones themselves do not cause the problem but rather excessive amounts of ketones. Ketotic cows will carry 40 to 50 mg per cent or even more. The ketone levels, then, is the best indicator of the severity of the problem.

Where do the ketones come from? Excessive ketones can come from feed, especially silage high in certain acids. They are also produced in the mammary gland. But the most important source of excessive ketones in clinical ketosis is production of ketone bodies in the liver from stored body fat.

Availability of glucose to the cow appears to be the limiting factor of milk production without resorting to stored fat. Once that limit is exceeded, the body will mobilize stored fat into the bloodstream to obtain extra energy at the risk of ketosis. The liver takes the circulating fat and converts it into ketones, while depositing some of the fat within its own tissues making the liver itself less efficient and more prone to problems.

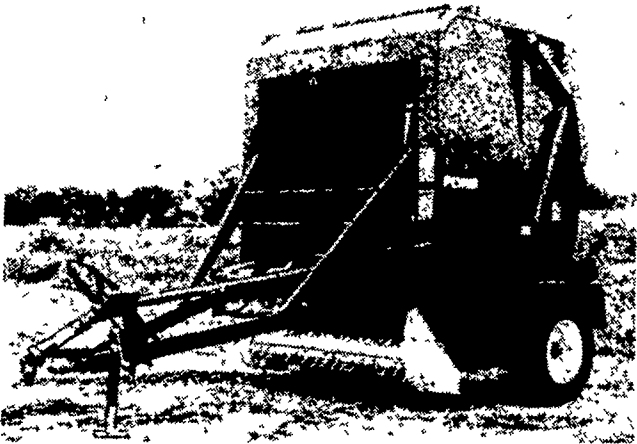
Then the problem becomes a vicious cycle. As ketones in the blood increase, the cow goes off feed, more fat is needed to maintain production, more ketones are produced, and the condition gets worse until milk production suffers sufficiently to lessen the energy requirement.

Ketosis may be primary, more energy required than that provided; or secondary, off feed for some other problem (displaced abomasum, hardware, etc.) and concurrent development of ketosis.

The list of treatments for acetonemia is long, suggesting that several things may be helpful and that no single treatment will cure all affected cows. Some ketotic cows will recover with no treatment, while others appear to not improve regardless of the treatment. In these cases the

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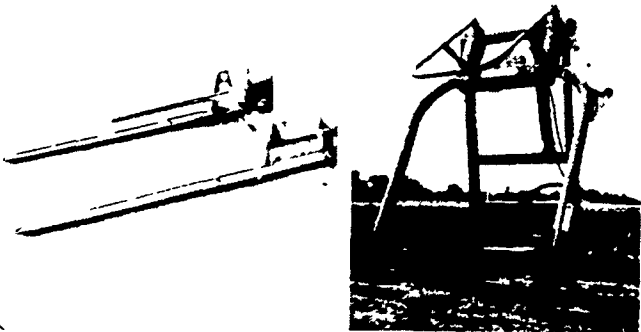
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