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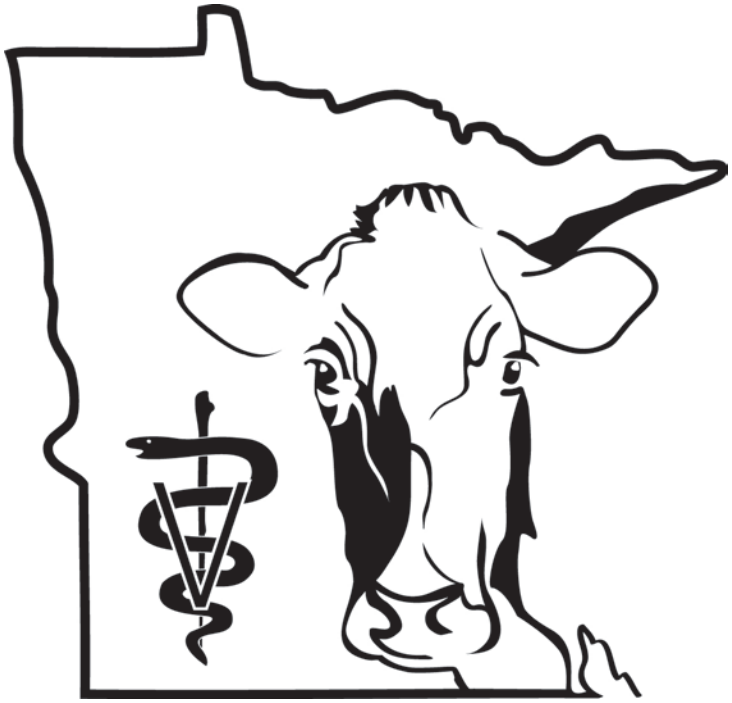

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Latest findings from research in transition cows: A randomized controlled trial on the treatment of ketosis in post-parturient dairy cows

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Introduction

Subclinical ketosis in dairy cattle has been associated with decreased milk production, decreased reproductive performance, increased risk of displaced abomasum and increased risk of clinical ketosis (Andersson, 1988; Duffield, 2000; LeBlanc et al., 2005). Elevated concentrations of ketone bodies have also been associated with a reduced ability to fight infections, such as in mastitis (Leslie et al., 2000).

The cost of subclinical ketosis has been estimated to be around $80 per case, based on production losses, increased risks of DA and clinical ketosis and delayed conception (Geishauser et al., 2001). In that simulation exercise, screening for subclinical ketosis followed by treatment of the positive cows yielded a benefit-cost ratio of 3 to 1 (Geishauser et al., 2001). However, the now common recommendation to use ketosis screen-and-treat programs is only based on the assumption that treating will prevent the anticipated losses (Enjalbert et al., 2001; Geishauser et al., 2001). Because secondary prevention trials in early lactation have yet to be published, it is still unknown how much of the losses may really be prevented by early treatment (Geishauser et al., 2001; LeBlanc et al., 2005).

The objective of this study was to determine the effect of post-parturient ketosis treatment on the occurrence of DA, milk production, reproductive performance and risk of removal from the herd.

Materials and Methods

The measurement of betahydroxybutyrate (BHBA) in serum or plasma is the gold-standard assessment of ketosis. Because blood BHBA measurement is rather costly and inconvenient to use in a screen-and-treat program, it is usually recommended to use cowside diagnostic tests instead (Geishauser et al., 2001). The Ketostix urine strip was used in this study at the cut-point of 15 mg of acetoacetate per dL of urine (shown as "small" on the scale provide with the test). At this level, the test has shown a sensitivity of 78% and a specificity of 96% to detect serum levels of BHBA greater than 1400 µmol/L (Carrier et al., 2004).

Fresh cows mostly between 1 and 15 DIM from 3 large Holstein herds were screened daily for the presence of urine ketones when returning from the morning milking. Cows with a concurrent or previous diagnosis of DA in the same lactation were not enrolled in the trial because DA is the primary outcome of interest in the study. Eligible positive cows were enrolled into the trial and randomly allocated to one of two groups: treated versus untreated control.

Treated group: On day 1 (at enrollment), treated cows received a standard ketosis treatment consisting of an IV bolus of 500 ml of 50% dextrose, 20 mg of dexamethasone IV and 5 ml of vitamin B-12 IV, as well as 400 ml of a glucose precursor (propylene glycol) per os SID. On day 2 and 3, a follow-up of 400 ml of propylene glycol SID was administered (Herdt and Emery, 1992;

Herdt and Gerloff, 1999). Cows in the treated group found with elevated urine ketones again after a 3-day ketosis treatment course were re-administered the same 3-day treatment, regardless of the clinical appearance of the disease.

Control group: Cows enrolled in the control group received no treatment for ketosis, even at subsequent occurrence of elevated urine ketones, with the following exceptions:

a) Any cow (control or treated) that may have shown signs of nervous ketosis could receive a ketosis treatment.
b) Any cow (control or treated) that developed a DA after enrollment was then allowed to be treated for ketosis if necessary following the standard protocol in place on each respective farm.
c) Cases of potentially severe clinical ketosis were allowed to be treated for humane reasons. In the treated group, these individuals were already taken care of as the protocol for the treated group addressed any cow with a positive test. In the control group, a case of clinical ketosis was defined as a cow meeting all of the followings criteria:
   - having a positive ketosis test on the day the decision was made ("small" urine ketones or higher),
   - having had the first positive ketosis test at least 5 days before (i.e. being enrolled for 5 days or more),
   - producing less than 40 lbs/d for 1st lactation cows, or less than 50 lbs/d for 2nd lactation and older.

   (See the enclosed *Notes about the definition of clinical ketosis* below for more explanations).

Those exceptions in the control group received the same full 3-day treatment course as a cow the treated group. If after that 3-day treatment urinary ketones were still found to be elevated in the "sick" control animal, the same milk production criteria had to be met in order to retreat the animal for ketosis (i.e. those whose production had improved above the production threshold were not retreated). In case of a rapid and otherwise unexplained deterioration of the condition of a ketonuric control cow, the 5-day requirement was relaxed if the caretaker deemed it necessary, which was very seldom the case.

All other medical conditions were treated similarly for cows in both treatment groups according to the standard operating procedures established for the respective dairies.

The treated cows will be compared to the controls for the following outcome variables:

a) occurrence of a DA following enrollment
b) short term daily milk weights
c) long term production for the entire lactation (all test days + 305 milk)
d) conception at 1st breeding
e) time-to-conception (by survival analysis to account for cows that do not breed back)
f) removal risk (sold or dead)

Results

The screening and enrollment process was started in the winter 2005 and terminated in December 2005. Many of the outcome variables will still be collected at the time of this presentation, but preliminary results will be presented.

Notes about the definition of clinical ketosis

The typical "textbook" signs of clinical ketosis are a marked decrease in milk production in the presence of ketone bodies, as well as presence of dry, scant feces, rough hair and selective anorexia (i.e. concentrates are refused before forage, and among forage sources, silages are refused before dry hay) (Fleming, 2002).

Those clinical signs are especially difficult to detect in the early post-partum period in loose-housed, TMR-fed cows: production in the first days of lactation is difficult to predict and may be affected by numerous other conditions, and feed intake and especially selective anorexia can not be monitored adequately on an individual basis. The ketone concentration itself, such as "small" versus "moderate" versus "large" on the Ketostix scale, is also a poor indicator of the clinical status, as low levels of urinary ketones are sometimes seen in obviously sick cows, as are very high levels in otherwise high-producing and healthy-looking cows (personal observation).

Because of this problem of defining what a case of ketosis requiring treatment is, the definition used in the study was based on two objective measurements: the level of production on the day a control cow was found again with ketosis and the time since the first diagnosis of ketosis. In practice, cows found with a positive ketosis test and very low production on the same day are likely to be treated for ketosis regardless of the presence of other clinical signs or concurrent diseases. On the other hand, by definition, cows with good production are unlikely to be suffering severe clinical ketosis. This is why a threshold level of production below which treatment would likely be administered in practice was used to differentiate the cows that may be suffering from clinical ketosis from those that were probably not (40 lbs/d for heifers, 50 lbs/d for older cows).

Because such low production levels are frequent in the 1st week of lactation, and because treatment of ketosis in the control group had to be a measure of last resort only, the requirement for an interval of five days between the day of enrollment and the day the latest positive test was added. In any case, five days of elevated urine ketones prior to a noticeably low production level is probably no worse than what usually happens in herds without a systematic screening program in place.

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