

A Field Trial on the Effect of Propylene Glycol on Milk Yield and Resolution of Ketosis in Fresh Cows Diagnosed with Subclinical Ketosis

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Introduction

Subclinical ketosis (SCK), a metabolic disorder that can affect more than half the cows in a herd, occurs in early lactation when dairy cows are unable to adapt to the changing energy requirements necessary for substantial milk production. While propylene glycol (PG) has long been used to treat clinical ketosis, its effect on SCK has not been studied, due in part to the monitoring necessary to diagnose the disorder. The recent identification and validation of the Precision Xtra meter (Abbott Laboratories, Abbott Park, IL), a rapid, accurate, and relatively inexpensive cow-side test for SCK, eases many of the previous difficulties associated with intensive monitoring programs. The purpose of this study was to determine the effect of oral PG administration on resolution of SCK, prevention of clinical ketosis, and milk yield in cows diagnosed with SCK.

Materials and Methods

Data were collected from four free-stall dairy herds: two in Cayuga County, New York (Farms A and B), one in Kewaunee County, Wisconsin (Farm C), and one in Calumet County, Wisconsin (Farm D) from May until August, 2010. Cows were each tested six times for SCK from three to 16 days-in-milk on Mondays, Wednesdays, and Fridays using the Precision Xtra meter. SCK was defined as a beta-hydroxybutyrate (BHBA) concentration of 1.2 to 2.9 mM/L; clinical ketosis was defined as ≥ 3.0 mM/L. Cows with SCK were randomized to treatment group (oral PG) or control group (no PG). Treatment cows were drenched with 300 mL PG once daily from the day they tested 1.2 to 2.9 mM/L until the day they tested < 1.2 mM/L. Outcomes evaluated for all farms included time from SCK until BHBA test < 1.2 mM/L or until BHBA test ≥ 3.0 mM/L. Individual milk weights for the first 30 days of lactation were evaluated for the three farms monitoring daily milk yield at each milking. Semiparametric proportional hazards models were used to evaluate time to event outcomes; repeated measures ANOVA was used to assess milk weights.

Results

A total of 741 of 1,823 (40.6%) eligible enrolled cows had at least one BHBA test of 1.2 to 2.9 mM/L. Of these, 372 were assigned to the treatment group and 369 to the control group. Based on hazard ratios, PG treated cows were 1.50 times more likely (95% confidence interval = 1.26 to 1.79, $P < 0.0001$) to resolve their SCK and 0.54 times less likely (95% confidence interval = 0.34 to 0.86, $P = 0.009$) to develop clinical ketosis than control cows. Across the three herds measuring individual milk weights, treated cows produced 0.51 lb (0.23 kg) more milk per milking in the first 30 days of lactation than control cows ($P < 0.0001$), for a total difference of 1.52 lb (0.69 kg) per cow per day. After identification of a treatment by herd interaction, stratification by herd showed that treated cows produced 0.97 lb (0.44 kg) more milk per milking on Farm A ($P = 0.0002$) and 1.17 lb (0.53 kg) more milk per milking on Farm B ($P < 0.0001$) in the first 30 days of lactation than control cows, for a total difference of 2.95 lb (1.34 kg) and 3.50 lb (1.59 kg) per day, respectively. There was no difference in milk yield, 0.04 lb (0.02 kg), per milking between the two groups on Farm D ($P = 0.70$).

Significance

These results show that SCK positive cows treated with oral PG were more likely to resolve their ketosis, less likely to develop clinical ketosis and, in some herds, produce more milk per milking in the first 30 days of lactation than control cows.

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