

A Field Trial on the Effect of Propylene Glycol on Displaced Abomasum, Removal from Herd, and Reproduction in Fresh Cows Diagnosed with Subclinical Ketosis

J. A. A. McArt¹, DVM; D. V. Nydam¹, DVM, PhD; G. R. Oetzel², DVM, MS

¹*Department of Population Medicine and Diagnostic Science, Cornell University, Ithaca, NY 14850*

²*School of Veterinary Medicine, University of Wisconsin, Madison, WI 53706*

Introduction

Dairy cows that suffer from subclinical ketosis (SCK), defined as an excess of circulating ketone bodies without clinical signs of ketosis, are at an increased risk of other parturient diseases such as displaced abomasum (DA) and metritis. Additionally, excess blood ketone bodies, commonly measured as beta-hydroxybutyrate (BHBA), have been associated with a decrease in reproductive efficiency. Propylene glycol (PG) is known to be anti-ketogenic by increasing plasma glucose concentrations and lowering non-esterified fatty acid and liver triglyceride levels, resulting in a decrease of plasma BHBA. The purpose of this study was to determine the effect of oral PG administration on development of DA and removal from herd in the first 30 days-in-milk (DIM), conception to first service, and days from voluntary waiting period (VWP) to conception within 150 DIM in cows diagnosed with SCK.

Materials and Methods

Data were collected from four free-stall dairy herds (two in Cayuga County, New York, one in Kewaunee County, Wisconsin, and one in Calumet County, Wisconsin) 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 BHBA concentration of 1.2 to 2.9 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 included development of DA and removal from herd in the first 30 DIM, conception to first service, and days from VWP to conception within 150 DIM. Mixed effects multivariable Poisson regression was used to assess the effect of PG on displaced abomasum, removal from herd, and conception to first service; a semiparametric proportional hazards model was used to evaluate the days to pregnancy outcome.

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 PG treatment group and 369 to the control group. A total of 39 cows (5.3%) developed a DA after testing positive for SCK and 30 cows (4.0%) died or were culled within the first 30 DIM. Based on risk ratios, control cows were 1.6 times more likely (95% confidence interval (CI) = 1.29 to 1.99, $P < 0.0001$) to develop a DA and 2.0 times more likely (95% CI = 1.15 to 3.63, $P = 0.01$) to die or be culled than cows treated with PG. There was no difference in conception to first service (risk ratio = 0.88, 95% CI = 0.65 to 1.21, $P = 0.43$) or days from VWP to conception within 150 DIM between treatment groups (hazard ratio = 0.98, 95% CI = 0.82 to 1.17, $P = 0.81$), with a mean time to conception of 42.6 days (SE = 2.02) and 44.3 days (SE = 1.95) for PG treated cows and control cows, respectively.

Significance

These results show that intensive detection of SCK followed by treatment of positive cows with oral PG reduced the risk of developing a DA or leaving the herd within the first 30 DIM. However, PG did not have an effect on conception to first service or days from VWP to conception within 150 DIM.

Acknowledgments

This project was supported by Agriculture and Food Research Initiative Competitive Grant No. 2008-55204-19393 from the USDA National Institute of Food and Agriculture and Boehringer Ingelheim Vetmedica, Inc. The authors thank the Cornell University and University of Wisconsin veterinary students for their invaluable assistance with data collection, as well as the owners of the collaborating dairies for allowing us access to their cows and facilities on which to conduct this research.