A randomized control trial to evaluate propylene glycol alone or in combination with dextrose as a treatment for hyperketonemia in dairy cows

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Introduction

Postpartum dairy cows undergo a period of energy deficit that can lead to excessive lipolysis and formation of ketone bodies such as β-hydroxybutyrate (BHB). Cows that are hyperketonemic (HYK; blood [BHB] ≥1.2mmol/L) are at greater risk of adverse events during early lactation. Although 300 ml of oral propylene glycol (PG) has been shown to reduce these negative effects, the efficacy of intravenous (IV) dextrose is unclear. Our objective was to investigate the impact of IV dextrose as an adjunct therapy to PG on HYK resolution, disease incidence, and milk yield.

Materials and Methods

Cows between 3 and 9 days (d) in milk (DIM) from 4 New York dairy farms were screened once weekly for HYK. Those with a blood [BHB] ≥1.2 mmol/L and no prior history of retained placenta, metritis or HYK were randomly assigned to 1 of the following 3 treatment groups: 1) 300 ml oral PG for 3 d (PG3); 2) 300 ml oral PG for 3 d with 500 ml IV dextrose on d 1 (PG3D1); or 3) 300 ml oral PG for 3 d with 500 ml IV dextrose on all 3 d (PG3D3). Cows with a blood [BHB] <1.2 mmol/L at initial screening were re-screened the following week (10 to 16 DIM) and randomly enrolled into the above treatment groups if blood [BHB] ≥1.2 mmol/L. Cows were assessed for post-treatment HYK resolution 1- and 2- weeks (wk) after initial treatment. Farm-diagnosed occurrence of adverse events (sold, died, metritis, displaced abomasum (DA), farm-diagnosed ketosis) during the first 60 DIM and milk yield during the first 10 wk of lactation were collected from herd management software. Fixed effects multivariable Poisson regression models were used to assess the risk of HYK resolution at 1- and 2-wk post-treatment and adverse event occurrence. Repeated measures ANOVA was used to assess differences in average daily milk yield between treatments.

Results

In total, 1249 cows were screened with a resulting HYK incidence of 30.1%; 64% were enrolled in the first wk (3 to 9 DIM) and 36% were enrolled in the second wk (10 to 16 DIM). After excluding 3 cows for not receiving all 3 d of therapy, 373 cows remained eligible for analysis (PG3: n = 121; PG3D1: n = 125; PG3D3: n = 127). The incidence of diagnosis of 1 or more adverse events during the first 60 DIM was 9.4% (metritis = 3.8%, DA = 1.9%, farm-diagnosed ketosis = 1.6%, culling or death = 5.6%).

There was no effect of treatment on risk of HYK resolution at 1- or 2-wk post-treatment (wk 1: PG3 = 19.2%, PG3D1 = 15.1%, PG3D3 = 16.8%, P = 0.2; wk 2: PG3 = 20.4%, PG3D1 = 17.9%, PG3D3 = 19.8%, P = 0.5), or risk of adverse event occurrence during the first 60 DIM (PG3 = 7.4%, PG3D1 = 8.0%, PG3D3 = 12.6%, P = 0.5). Average daily milk yield was similar between treatment groups (PG3: 85.3 lb [38.7 kg]/d, PG3D1: 84.4 lb [38.3 kg]/d, PG3D3: 84.9 lb [38.5 kg]/d, P = 0.9).

Significance

Intravenous dextrose for 1 or 3 d as an adjunct therapy to oral PG for treatment of HYK provided no improvement in resolution of HYK, reduction in adverse events, or increase in average daily milk yield over treatment with PG alone.