Introduction

Stevia, a glycoside isolated from the stevia plant, can be found in a wide range of equine products. Certain refined steviosides are considered by the FDA to be safe for human consumption, including for those with diabetes, insulin resistance, and metabolic syndrome.

Stevia is thought to stimulate insulin release from the beta cells of the pancreas, thereby lowering circulating glucose levels. Horses with EMS present with hyperinsulinemia but, unlike humans, have normal circulating levels of glucose. There is no data available to assess the safety or metabolic effects of stevioside in the equine. With the increasing prevalence of stevioside in the equine market, it has become important to understand the metabolic and inflammatory effects in both normal and metabolic syndrome horses.

The objectives of this study were thereby to assess the effects of stevioside on insulin and glucose dynamics, as well as measure inflammatory responses in horses with EMS as compared to non-EMS controls.

Materials and Methods

16 mixed breed and mixed sex horses, 8 EMS and 8 age matched controls were selected. EMS was determined by the criteria set forth by Frank et al., 2010; increased obesity, insulin resistance, and a history of or predisposition to laminitis. All horses were also screened to ensure they did not suffer from pituitary pars intermedia disorder (PPID).

Results

For serum insulin (figure 1), EMS horses were higher compared to controls and horses given karo were higher compared to those given stevia. Horses at time point 60 had higher insulin levels compared to time points 0 and 240. There was an EMS vs control by time interaction and a stevia vs karo by time interaction. There was also a three way EMS vs control by stevia vs karo by time interaction, with EMS horses given karo at time point 60 higher in insulin compared to all other horses, control horses given karo at time point 60 higher compared to control horses given stevia, and EMS horses given stevia at time point 240 given stevia higher compared to control horses given karo or stevia. Serum glucose (figure 2) showed EMS horses higher compared to controls and horses given karo higher vs horses given stevia. Horses at time point 60 were higher in glucose compared to time points 0 and 240, and there was an effect of period. There was an EMS vs control by time interaction for glucose, with EMS horse higher compared to controls at time points 0 and 240. There was also a stevia vs karo by time interaction, with horses given karo at time point 60 higher compared to horses given stevia. TNF-α % gated (figure 3) exhibited an overall effect of period and an EMS vs control by time interaction, with the control horses higher compared to the EMS horses at time points 0 and 240, but EMS horses higher compared to controls at time point 60. There was an overall effect of period for TNF-α MFI (figure 4), an EMS vs control by Stevia vs Karo interaction (EMS horses higher compared to controls at time point 60), and an EMS vs control by time interaction (control horses given karo lower compared to control horses given stevia).

Conclusions

- EMS and control horses exhibited increases in metabolic and inflammatory parameters at time point 60, with EMS horses typically having an exaggerated response.
- Stevia did not have the same effect on metabolic measurements as karo and decreased glucose levels in EMS horses given stevia at 60 minutes may suggest increased insulin receptor sensitivity.
- Stevia appears to be safe for consumption for horses with EMS, although further work may be warranted to explore possible inflammatory effects in metabolically normal animals and possibly beneficial effects in horses with EMS.
- This work raises new questions about the response of EMS horses to an oral sugar challenge, in particular with regards to inflammation.