

The effect of different levels of energy restriction on physical, metabolic, morphometric and animal welfare parameters

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Introduction: With a reported prevalence of up to 45%, equine obesity is becoming a major problem in modern horse management (Thatcher et al., 2008; Wyse et al., 2008). Equine obesity has been associated with other conditions, such as insulin resistance and an increased risk for laminitis (Quinn et al., 2006; Geor, 2008). Consequently weight loss achieved through a combination of dietary energy restriction and where possible increased activity is crucial in obese horses. The aim of this study was to exam the effect of different levels of energy restriction on morphometric and metabolic parameters in obese ponies.

Material and methods: 18 obese Shetland geldings (BCS 8±1/9) were studied over a 23.5 week period. Throughout this study, ponies received low energy hay (8.08 MJ/kg DM) and a commercially available protein, vitamin and mineral supplement (Spillers Gro'n Win®, MARS Horsecare). The study started with a 4 week adaption period (w1-4) in which maintenance energy requirements (MER) to maintain stable obese body weight were determined (ie 100%MERob). During the 16.5 week weight loss period (WLP; w5-21.5), ponies were randomly divided into 3 groups: a control group (C), a 'slow' (S) and a 'rapid' (R) weight loss group that received respectively 100, 80 and 60% of their individual MER. The study ended with a 3 week period (w22.5-24.5) in which all groups received again 100% of MERob in order to evaluate any weight gain rebound effect. Physical (BW), metabolic (glucose, insulin, triglycerides (TG), free fatty acids (FFA), leptin), morphometric (BCS, cresty neck score (CNS), ultrasound, heart and belly girth) as well as gastric ulcer score (GUS)(Andrews et al., 1999) were measured and evaluated. Kruskal-Wallis test was used for the non- parametric values (BCS, CNS and GUS) and general linear model was used for the parameters with a normal distribution. Significance was set at $P < 0.05$.

Results and discussion: All ponies remained clinically healthy. Between w5 and w22.5, weight loss was significant higher in the R group compared to the S and C group. Weight gain was significantly higher in the R group compared to the C group between w22.5 and w24.5. A significant treatment effect was also found between w22.5 and w24.5 for TG between groups C and R as well as between C and S, and for FFA between groups C and R. There was a trend for lower leptin levels in the S and R groups at the end of the WLP compared to the C group. Between w22.5 and w24.5, a significant treatment effect was seen between C and S group as well as between the C and R group for leptin. BCS was significantly lower at w22.5 and w24.5 compared to w5 in the R group and compared to the S plus C group. Heart girth was significantly lower in the R group compared to the C group between w5 and w22.5. Between w22.5 and w24.5, significant effects were seen between the C and S plus C and R. Between w5 and w22.5, belly girth circumference changes were significantly different from each other, with the highest relative decrease in the R group. Between w22.5 and w24.5, treatment effects were significant between group C and S plus C and R. Ultrasound showed significant relative decreases in fat depth at the level of the tail head between w5 and w24.5 between groups C and R as well as C and S. Decreases in relative loin fat depth between w5 and w22.5 were more pronounced in the R and S group compared to C and S. Similar effects were found for the rib fat depth. No significant treatment effect was found for glucose, insulin, CNS and gastric ulcer score.

Conclusion: A significant higher weight loss and weight gain rebound effect was found in the 60% MER energy restricted group compared to the lower energy restricted group (80%MER). There were no negative effects on metabolic parameters with either dietary regimen.