SYMPOSIA AND ORAL SESSIONS

Animal Health I

1 Obesity in horses: An equine metabolic syndrome? P. J. Johnson*, V. K. Ganjam, and N. T. Messer, *University of Missouri*, *Columbia*.

Similar to the situation in human society, obesity is common in domesticated equids. Broad parallels exist between causative factors with relevance to both species. Horses develop obesity when they are fed rations that exceed nutritional requirements under management systems that fail to provide substantive physical inactivity. Obese humans often develop insulin resistance (IR), hypertension, atherogenic dyslipidemia, chronic inflammation, and a tendency to a procoagulative state. This constellation of clinical disorders has been termed the "metabolic syndrome" and its presence signifies high risk for many potentially fatal conditions including cardiovascular diseases (atherosclerosis, myocardial infarction, stroke), diabetes mellitus, liver disease, cancer, neurodegenerative disease, and polycystic ovarian disease. An "equine metabolic syndrome" (EMS) has been described in which obesity and IR are risk factors for laminitis ("founder"). Laminitis is a painful, crippling affliction of the equine digit (hoof), which often necessitates euthanasia for severely affected individuals. The extent to which other aspects of the human syndrome may or may not play a role in EMS is less certain, controversial, and the subject of substantial current investigation.
Horses and (especially) ponies evolved as a thrifty species. Health was assured by the persistent physical mobility associated with seeking out native prairie grassland species and the evasion of predators. Horses and ponies tended to migrate over considerable distances to obtain sufficient food for survival. Evolutionary forces ensured that the modern horse was thoroughly adapted to the available grassland forage species that grew abundantly in their domain. The impositions of the needs of human management have been such that domesticated horses are (usually) fed rations that differ greatly from those anticipated by evolutionary selection. Coupled with enforced physical confinement and the elimination of predators, modern horses commonly develop obesity and the attendant endocrinopathic health consequences.

Key Words: Horse, Obesity, Metabolic Syndrome

2 Steers grazing toxic *Neotyphodium coenophialum*-infected forages have increased hepatic gluconeogenic capacity. K. R. Brown*[1], J. L. Klotz[2], J. R. Strickland[2], L. P. Bush[1], J. A. Boling[1], and J. C. Matthews[1], [1]*University of Kentucky*, *Lexington*, [2]*Forage-Animal Production Research Unit, USDA-ARS*, *Lexington, KY*.

Impaired growth performance and clinical parameters constituting summer slump in cattle grazing toxic endophyte-infected tall fescue are well documented. To test the hypothesis that fescue toxicity affects carbon chain and amino acid N metabolism in the liver of cattle grazing this forage, 19 Angus steers were randomly assigned to graze either a low-endophyte (LE; 6.8% infection) mixed grass-tall fescue pasture (n = 9; BW = 266 ± 10.9 kg; 5.7 ha) or a high-endophyte (HE; 62.8 % infection) tall fescue pasture (n = 10; BW = 267 ± 14.5 kg; 5.7 ha) for 89-105 d. Pasture samples were collected on d 37, 59, 88 and 109, pooled, and analyzed for alkaloid content. Blood was collected on d 85 for serum prolactin (PRL) analysis and steers then killed over a 17-d period, with treatment animals equally distributed over d of kill. HE pasture samples contained (μg/g) 24 and 38 times more ($P < 0.01$) ergovaline (0.322) and lysergic acid (0.065), respectively, than did LE pastures. Serum PRL of HE steers was ($P < 0.01$) 10% (3.60 ng/mL) that of LE steers. Whereas liver alanine transaminase content did not differ, aspartate transaminase (AST) and cytosolic phosphoenolpyruvate carboxykinase (PEPCK-C) content was 56% and 90% greater ($P < 0.01$), respectively, in HE steers. In contrast, hepatic content of glutamate synthetase, glutamate dehydrogenase, and 3 transport proteins responsible for high-affinity aspartate/glutamate uptake in the liver did not differ. Together, the increased hepatic content of AST and PEPCK-C of HE steers indicates that increased alkaloid challenge, depressed serum PRL, or both, induces a greater capacity for liver gluconeogenesis, met in part through an increased expression of proteins that metabolize aspartate carbons to oxaloacetate and oxaloacetate to phosphoenolpyruvate.

Key Words: Endophyte, Gluconeogenesis, Liver

3 Grazing endophyte-infected tall fescue alters serotonin receptor-induced contractility of bovine lateral saphenous veins. J. L. Klotz*[1], K. R. Brown[2], Y. Xue[2], J. C. Matthews[2], J. A. Boling[2], L. P. Bush[2], and J. R. Strickland[1], [1]*USDA-ARS, FAPRU*, *Lexingon, KY*, [2]*University of Kentucky*, *Lexington*.

Concurrent with grazing of endophyte-infected tall fescue is the consumption of toxic alkaloids that negatively affect cardiovascular function and result in fescue toxicosis. Vascular effects of ergopeptine alkaloids are mediated by stimulation of various biogenic amine receptors yet to be fully characterized. The objective was to evaluate the effect of grazing 2 levels of toxic endophyte-infected tall fescue on the vasoconstrictive activities of (±)-1-(2,5-dimethoxy-4-iodophenyl)-2-aminopropane hydrochloride (DOI), BW 723C86 (BW), CGS-12066A (CGS), and 5-carboxamidotryptamine hemiethanolate maleate (5CT), agonists for 5-hydroxytryptamine $(HT)_{2A, 2B}$, $5\text{-}HT_{1B}$ and $5\text{-}HT_7$ receptors, respectively. Segments (2-3 cm) of the cranial branch of the lateral saphenous vein were collected at time of slaughter from steers following a 114 to 127-d grazing period of either a low endophyte-infected (LE) mixed grass pasture (10% infection; n=8; BW=333 ± 10 kg) or a high endophyte-infected (HE) tall fescue pasture (92% infection; n=8; BW=311 ± 9 kg). Veins were sliced into 2-3 mm sections and suspended in a myograph chamber containing 5 mL of oxygenated Krebs-Henseleit buffer (95% O_2/5%CO_2; pH=7.4; 37°C) and allowed to equilibrate at 1 g of tension for 90 min. Increasing concentrations of DOI, BW, CGS, and 5CT were administered every 15 min. Data were normalized (%) to the contractile response induced by a reference dose of norepinephrine ($1x10^{-4}$ *M*) and data for each treatment were analyzed for effects of concentration and endophyte level. Maximal contractile intensities achieved with DOI were decreased 35% ($P < 0.05$) in steers grazing HE pastures, whereas those achieved with 5CT were increased 37% ($P < 0.05$). The contractile response to CGS did not differ between pasture groups and there was an absence of contractile response to BW in both groups. Grazing HE pastures alters vascular responses which may be mediated through modified serotonin receptor activities.

Key Words: Bovine, Fescue, Serotonin