Horse Species

TH83 Temporal variables of the Arabian and Morgan Western Pleasure Jog. M. Nicodemus* and A. Luckett, *Mississippi State University*, *Mississippi State*.

The western pleasure class is one of the most popular rail classes for the Quarter Horse, Paint Horse, Arabian, and Morgan. However, kinematic research defining western pleasure gaits is only available for the stock-type breeds. Therefore, the objectives of this study were to define the jog of the western pleasure Arabian and Morgan and to compare the jog of these two breeds. 7 registered Arabians and 7 registered Morgans showing in a western pleasure class at their respective national competitions were filmed at 60 Hz performing the jog. Carded judges for their respective breeds selected the horses and strides that were used in this study according to breed standards. Frame-by-frame analysis of 5 strides for each horse was performed to determine temporal variables. Means (standard deviations) were determined with duration variables given as a percent of stride duration. Effect of breed type for each variable was tested using a one-way analysis of variance (P<0.05). Both breeds performed a symmetrical, 4-beat stepping gait with a lateral footfall sequence and diagonal couplets (Table). For both breeds, the majority of the stride was spent in the stance phase with the longest period of limb support being diagonal bipedal support (Arabian: 83±3%, Morgan: 77±3%) followed by quadrupedal support (Arabian: 12±1%, Morgan: 16±1%). Analysis of variance indicated no significant difference between breeds for the measured variables. The only distinguishing factor between the two breeds was that only the Arabian demonstrated pairing of the diagonal limbs as the limbs came off the ground. Due to this pairing of the diagonal limbs found only in the Arabian, the Arabian was the only breed that lacked a period of tripedal limb support with two hind limbs. The objective description of these gaits from these measured variables can be applied in the selection and evaluation of the western pleasure Arabian and Morgan.

	Arabian	Morgan
Velocity (m/s)	1.69±0.16	1.92±0.21
Stride Length (m)	1.57±0.19	1.86±0.17
Stride Frequency (strides/s)	1.08±0.08	1.03±0.04
Stride Duration (ms)	921±48	971±42
RF Stance (%)	58±2	60±1
LF Stance (%)	59±1	60±3
RH Stance (%)	56±2	59±2
LH Stance (%)	56±1	59±3
Tripedal-2 Fore (%)	5±4	5±3
Tripedal-2 Hind (%)	0±0	2±1
LF-RH Advanced Placement (%)	3±2	2±1
RF-LH Advanced Placement (%)	2±1	3±1
LF-RH Advanced Lift-Off (%)	0±0	2±1
RF-LH Advanced Lift-Off (%)	0±0	2±2

Key Words: Temporal Variables, Western Pleasure, Jog

TH84 Use of chicken vs. chukar (*Alectoris chukar*) egg yolk as components of freezing media for stallion semen. S. E. Harmon and G. W. Webb*, *Missouri State University*, *Springfield*.

Recent published reports have indicated a possible increase in post-thaw motility and viability for stallion spermatozoa when the chicken egg yolk

in the freezing media is replaced by that of other avian species (including duck, quail and pigeon). Two experiments were conducted to compare the affects of chicken vs. chukar (*Alectoris chukar*) egg yolk on post thaw motility of stallion spermatozoa. In each experiment, three ejaculates were collected from each of 4 stallions. Immediately post collection aliquots of each ejaculate were diluted 1:1 with INRA 96™extender (IMV, International), centrifuged to remove the seminal plasma, split into 8 parts and resuspended with one of 8 fast freeze (experiment 1) or 8 slow freeze extenders (experiment 2) to a final concentration of 150 x 10^6 spermatozoa/ml. Aliquots frozen using the fast freeze method were diluted with extenders which consisted of Lactose-EDTA containing 4% glycerol and either 13, 16, 19, or 22% of either chicken or chukar egg yolk and allowed to equilibrate for 30 min and loaded into 0.5 ml straws. Prior to freezing straws were suspended 8 cm above the liquid nitrogen for 10 min. Aliquots frozen using the slow freeze method were diluted in INRA 96™ supplemented with 4% glycerol and either 2, 4, 6, 8% of either chicken or chukar egg yolk. Aliquots were then placed in a 23º C water bath for equilibration and cooling to 4º C over a 2 h period prior to freezing using the same procedure as (experiment 1). After a minimum of 2 wks storage two straws per ejaculate/treatment combination were thawed and evaluated for motility using CASA (CEROS®; Hamilton Research Inc, Beverly, MA). Post storage percentage of intact acrosomes of these same samples was evaluated following staining with Spermac Stain™(FertiPro, Beernem, Belgium). Data were analyzed using a GLM procedure with a one-way ANOVA and Tukey′s used to test differences between treatments. Within freezing method (fast vs. slow) there was no effect (P≤0.05) of egg yolk source on post thaw motility or percentage of intact acrosomes and therefore no advantage observed by substitution of chicken with chukar egg yolk as a component of freezing diluents for stallion spermatozoa.

Key Words: Stallion, Semen, Egg Yolk

TH85 Nutrient composition and selection preferences of forages by feral horses: The horses of Shackleford Banks, North Carolina. S. J. Stuska[1], S. E. Pratt*[2], H. L. Beveridge[2], and M. J. Yoder[2], [1]*Cape Lookout National Seashore, Harkers Island, NC*, [2]*North Carolina State University, Raleigh*.

Health of the horses of Shackleford Banks is influenced by the nutritional composition of the plants that are consumed. Over the years, cases of developmental orthopedic disease have been observed in growing horses, which may be due to nutritional imbalances in the diet. However, assessing nutritive status of wild herbivores is challenging; it is difficult to accurately determine what is being consumed. Forage nutrient content analysis coupled with fecal analysis can give an estimate of the nutritive profile for the animal, though it does not determine total daily intake. Horses were observed and representative samples of what they were eating were collected during four seasons over two years. Samples were analyzed for DM, CP, Ca, P and DE (reported as DM). Fresh fecal samples were also collected and pooled during the second year of the study for microhistological analysis to estimate selection and proportions of plant species consumed. Significant differences in seasonal variation in plant consumption and nutritive content was determined with ANOVA. Plant selection and nutrient composition of the plant was significantly different across the seasons. In the fall, seaoats (*Uniola paniculata*) (41.6%), centipede grass (*Eremochloa ophiuroides*) (23.9%)

430

J. Anim. Sci. Vol. 86, E-Suppl. 2/J. Dairy Sci. Vol. 91, E-Suppl. 1

and smooth cordgrass (*Spartina alterniflora*) (12.5%) made up 78.0% of the horse′s diet. In the winter, consumption of seaoats decreased by half, while the variety of plants consumed increased. In the spring, centipede consumption dropped in favor of increased seaoats, cordgrass, and pennywort. In the summer, seaoats (30%), centipede (14.8%) and cordgrass (19.5%) made up 64.3% of the horse′s diet with other plants making up the difference. Cordgrass had the highest DE (2.28 ± 0.32 Mcal/kg) and CP (10.2 ± 2.1%) throughout the year. Seaoats and centipede had lower mean nutrient profiles over the seasons; 1.7 ± 0.05 Mcal/kg DE, 5.31 ± 0.4% CP and 1.8 ± 0.09 Mcal/kg DE, 5.07 ± 1.4% CP respectively. Given the average nutrient composition of the forages, high dietary intakes would be required for these horses to meet their nutritional needs. It is possible that nutrient deficiency contributes to growth problems observed in these horses.

Key Words: Feral, Horse, Nutrition

TH86   Estimation of body weight in ponies. G. S. Owen*[1], E. L. Wagner[1], and W. S. Eller[2], [1]*Auburn University*, *Auburn, AL*, [2]*Louisiana State University*, *Baton Rouge*.

The ability to accurately estimate body weight in horses and ponies is of great benefit in the dosage of medication and anthelmintics, as well as in feeding management practices. An established formula is widely used to estimate the body weight of horses, where estimated weight (lbs), (kg) = (heartgirth[2] x body length)/(330 in[3]), (11880 cm[3]). The objective of this study was to validate the use of a weight estimation formula in ponies, which measure less than or equal to 14.2 hands (147.3 cm) at the withers. Sixty-eight ponies were weighed on a calibrated livestock scale, and measurements of heartgirth, body length and height at the withers were recorded. Mean pony height was 134.4±10.8 cm, with a mean scale weight of 343.7±82.6 kg and a mean body condition score of 5.7±1.0 on a nine-point scale. A paired t-test determined that there was a significant difference (P < 0.05) between actual weight (343.7±82.6 kg) and weight estimated by the established formula (310.2±76.4 kg). Linear regression was used to fit the body measurements and weight data to a model based on the established formula. Due to the low n in the model, bootstrap estimation with 5000 replications was used to estimate the parameters. A new coefficient (299 in[3], 10787 cm[3]) was estimated in fitting the model (R[2] = 0.99). The estimated denominator was found to be significantly different from the denominator in the previous formula (P < 0.05). Inclusion of the new coefficient in the formula appears to reliably estimate the actual body weight in ponies.

Key Words: Pony, Weigh Estimation, Body Measurements

TH87   Basal insulin and glucose concentrations in horses of North Carolina. K. M. Owens*, S. E. Pratt, L. E. Dowler, and M. T. Cloninger, *North Carolina State University*, *Raleigh*.

In equines, research suggests an associative role of decreased insulin sensitivity (insulin resistance) in disease states such as laminitis and metabolic syndrome. There are little data available regarding values of insulin sensitivity among large horse populations due, in part, to the difficulty of quantification. Basal glucose and insulin concentrations have been used to estimate glucose and insulin dynamics. The objectives of this study were to determine ranges of basal glucose and insulin concentrations in horses of North Carolina and to determine how these are related to management and innate factors (diet, age, gender, breed, etc.). Horse owners were solicited through various North Carolina equine publications and websites to identify volunteers. Horses (n = 366) were sampled at their home farms by one of three trained personnel between August and December, 2007. Owners completed a questionnaire with information pertaining to age, breed, medical history and exercise protocols. Also, body weight, feed intake and body condition score (BCS) was assessed by the authors. Blood samples were collected via jugular venipuncture for assessment of serum insulin (INS) and plasma glucose at least 4 hours post-feeding or exercise. The insulin: glucose ratio (I:G) was calculated from this data. Mean (± SD) INS and I:G were 13.7 ± 29.4 mIU/L and 3.2 ± 2.6 mIU/L/mM respectively. Both I:G and INS were positively correlated with age (I:G r = 0.129, *P* = 0.025; INS r = 0.118, *P* = 0.040) and BCS (I:G r = 0.135, *P* = 0.019; INS r = 0.161, *P* = 0.005). Neither body weight nor concentrate consumption (as % body weight) were related to INS or I:G. There were no significant differences among mares, geldings or stallions. Breeds had significantly different I:G (*P* = 0.030), with pony breeds being significantly higher than breeds such as the Quarter Horse. Pony breeds, older horses and those with high BCS should be carefully managed. Approximately 9% of horses sampled were hyperinsulinemic (defined as INS > 30 mIU/L) regardless of BCS. While not a quantitative measure of insulin sensitivity, hyperinsulinemia may indicate a risk for insulin resistance and associative conditions.

Key Words: Equine, Insulin, Glucose

TH88   Equine identification in the Amish community: An overview of a survey conducted in Pennsylvania. A. Swinker*, K. Vanderman, H. McKernan, A. Graeff, and B. Gill, *The Pennsylvania State University*, *University Park*.

Amish are a Christian settlement from Europe that settled in North America in the eighteenth and nineteenth centuries. The Amish relied heavily upon equid for transportation and farm work. Today they reside in 27 states. Pennsylvania's Amish population totals 4,294 households. About 70 percent of the US Amish live in Ohio, Pennsylvania, and Indiana; with Lancaster County, PA being the second largest settlement. Understanding the concerns of the Amish is essential to help NAIS (National animal Identification System) with equine tracking and identification. The average Pennsylvania Amish household reported owning 5.6 equid. The objectives of this study were; 1) acquire an Amish population to survey, 2) sample the Amish community to measure their concerns and acceptance of NAIS and 3) to acquire questionnaires completed by Amish families. A total of 78 Amish households were asked to participate in the survey. Thirty-two families did participate in the survey. The survey was conducted by an enumerated written questionnaire and asked question related to equine ownership, animal and premises identification. Surveys were edited for completeness, legibility, accuracy and validity. Data were analyzed, SPSS (SPSS Inc., Chicago, IL) for descriptive and inferential statistics. Sample consisted of 2 women and 30 men, 25 percent reported to be in the horse business. Eighty-seven percent of surveyed respondents refused to participate in the NAIS program, one person was willing to participate and 3 were uncertain. Eighty eight percent of respondents reported hearing about NAIS by word of mouth while 43percent read about it in newspapers or breed magazines. Of those sampled only one had a premises ID number and four were unsure. Twenty Seven reported they did not have a premise ID number. When asked about their level of concerns the Amish report a high level of concern about recovering

lost or stolen horses. They also considered tracing sources of, spread of and notification of disease a high concern. However, confidentiality of information was rated moderate and an improved identification method for horses was of low concern.

Key Words: Equine, Amish, Identification

TH89   Equine show and event manager survey of resistance to the implementation of national equine identification. A. Swinker*, K. Vanderman, A. Graeff, K. Vines, and B. Gill, *The Pennsylvania State University*, *University Park*.

The NAIS (National Animal Identification System) is a program to identify and record the movement of animals in the event of a foreign animal disease outbreak. Survey objectives were to collect input from equine event managers concerning the National Animal Identification System and identify its application to the equine industry. A fifteen question on-line survey was developed related to emergency preparations, premises information, equine travel, NAIS opinion, and how NAIS could be incorporated into equine event management. The survey was sent to 250 email addresses reaching 243 equine show managers with representation from all 50 states and Canada. Shows of a variety of sizes were represented, ranging from large sanctioned breed shows to small local events. The survey was open to invited participants only. At the close of the data collection 152 people visited the site and 115 had completed surveys. The return rate was 47.3%. Seven addresses were undeliverable. Data were analyzed using SPSS (SPSS Inc., Chicago, IL) for descriptive and inferential statistics. Twenty-five percent of the surveyed managers reported being in favor of NAIS, 42% were neutral, 14% were unsure while 18% were opposed. Survey results showed a real need to educate equine show managers on the benefits of NAIS. When asked, at your equine event, would microchipping equid for identification be useful 40% reported that it would be useful to verify equine ID and prevent fraud. Thirty-seven percent reported it would prevent/deter theft of equid from the show grounds and 34% reported it would prevent the incorrect equine from being shown. However, 53% reported NAIS will increase paper work at events. Equine show and event managers reported some benefits of utilizing NAIS.

Key Words: Equine, Show, Identification

TH90   United States equine owner's survey on the implementation of national equine identification. K. Vanderman*, A. Swinker, H. McKernan, B. Gill, and R. Radhakrishna, *The Pennsylvania State University*, *University Park*.

A survey was designed to assess the composition of the equine industry, and identify resistance to and the impact of the National Animal Identification System (NAIS) on equine owners. A six-section, traditional paper survey was developed with questions related to ownership, emergency preparations, premises information, equine travel, NAIS opinion, and demographic characteristics. A mailing list of 10,010 name/addresses of horse owners was created representing 14 major equine groups. A sample (N= 2,783) received surveys randomly with follow up mailings, resulting in a response rate of 50.16%. SPSS (SPSS Inc., Chicago, IL) was used for descriptive and inferential statistics. Pearson's correla-

tion, simple linear regression and multiple regression were used to determine the relationship between select variables. Data showed that 55.5% of equine owners do not have a plan of action for their equid during a disaster and 80% do not practice biosecurity. The majority of owners (62.8%) reported they were not familiar with NAIS, 32.7% were somewhat familiar, and 4.2% were very familiar. Sixteen percent were interested in participating in NAIS, 52% were unsure, while 32% were not interested. Over 73% identify their equine by color/markings, followed by DNA (43.3%), tattoos (30.8%), and hair whorls (21.9). About 3% use microchipping to identify their equid. Approximately 81.4% were familiar with microchipping as a form of identification, and 21.7% own other animals that were microchipped. The majority of respondents were "very concerned" regarding tracing the source of a disease and eliminating its spread (47.5%), being notified about disease outbreaks in their area (57.5%), recovering lost or stolen equid (49.9%), and maintaining confidentiality of information (40.9%). Survey results indicated that equine owners should be educated about the spread of disease, the role of NAIS, and additional benefits of participation such as equine theft recovery. This education would assist the equine industry in its acceptance of NAIS.

Key Words: Equine, Identification, NAIS

TH91   Equine veterinarians and health care professionals survey of resistance to the implementation of national equine identification. N. Dreschel*, K. Vanderman, A. Swinker, E. Jedrzejewski, and J. Werner, *The Pennsylvania State University*, *University Park*.

The National Animal Identification System (NAIS) is a program to identify and track animals for disease monitoring. A survey was designed to evaluate equine health care professionals' attitudes towards NAIS and the application of NAIS to the equine industry. A twenty-seven question survey related to emergency preparations, premises information, equine travel, NAIS opinion, disease outbreaks, and how NAIS can be utilized in a veterinary clinic measured participants' responses. An online survey was e-mailed to equine veterinarians and health care professionals that were members of AAEP's (American Association of Equine Practitioners) chat group. This group represents veterinarians from all regions of the United States. The survey was available only to these invited participants and was not open to the public. At the close of the survey, 158 people have visited the survey site and 139 surveys were completed. SPSS (SPSS Inc., Chicago, IL) was used for descriptive and inferential statistics. Pearson's correlation, simple linear regression and multiple regression were used to determine the relationship between select variables. Of those who reported, 47% are in favor of NAIS, 4% are opposed, and 50% are neutral or unsure. When asked, "Do you feel that NAIS will be useful in quickly stopping the spread of a foreign animal disease?", 55% reported yes and 45% felt it would not. Equine health care providers rated their familiarity with NAIS as not at all familiar (17%), somewhat familiar (62%), or very familiar (21%). The majority of respondents (75%) do not use microchip numbers as part of their client database, although 53% are currently microchipping animals. Other studies have shown that equine owners receive the majority of their equine care information from their veterinarians. By further informing this group, there is an opportunity to increase awareness and education of NAIS.

Key Words: Equine, Identification, Veterinarians

432

J. Anim. Sci. Vol. 86, E-Suppl. 2/J. Dairy Sci. Vol. 91, E-Suppl. 1

TH92 Application of forensic science technique to the management of an endangered horse population. E. Bömcke*[1,2] and N. Gengler[1,3], [1]*Gembloux Agricultural University, Gembloux, Belgium*, [2]*FRIA, Brussels, Belgium*, [3]*FNRS, Brussels, Belgium*.

Implementing conservation strategies needs the knowledge of relationships inside the concerned population. The aim of the study was to find tools to help breeders to manage populations with weak pedigree information. The Skyros pony is an indigenous Greek breed with breed risk status is defined as critical-maintained (Food and Agriculture Organization). Partial pedigree information is available, but its quality is poor as the average number of generation-equivalents is under 0.8 for the first known generation and under 1.4 for the second to the fifth. A method used in human forensic science and called Familial Searching was tested in this study to improve the pedigree. First, 99 living individuals were genotyped at 16 microsatellite loci. For ungenotyped animals, conditional expectation of gene contents was calculated given molecular and pedigree data. In Humans, Familial Searching is used, in addition to matching DNA evidence directly to criminal profiles, to search for people (present in a database) who are related to an individual that left the DNA evidence. This method is based on the calculation of decision statistics (likelihood ratio (LR)) between the genotype of an individual and the genotype of each other analyzed individual, where a higher LR indicates greater probability to be related, a value of zero means no probability to be related. The known pedigree was used as 'local' prior information, i.e. information related to specific pairs of individuals. General knowledge about the studied population (generation interval, sexual maturity, …) was considered as 'global' prior information. Including prior information reduced the number of comparisons by over 50%. First results showed that the parents were always classified into the 5 highest LR. It also simplified parentage verifications, as it allowed the detection of 90% of false parentage (LR=0). By creating new links in the pedigree through the detection of unregistered parents, the percentage of animals with one or both unknown parents decreased and consequently the number of generation-equivalents increased. Therefore Familial Searching was found to be a useful tool to improve the pedigree of the Skyros breed.

Key Words: Likelihood, Pedigree, Horse

TH93 Sites of active nutrient absorption in the equine gastrointestinal tract. B. E. Aldridge*, T. B. Lescun, and J. S. Radcliffe, *Purdue University, West Lafaytette, IN*.

Nine horses were used to investigate active nutrient absorption in the proximal (13.7 m from the ileocecal junction) and distal (9.1 m from the ileocecal junction) jejunum, ileum (5 cm from the ileocecal junction) and mid-right ventral colon using modified Ussing chambers. Immediately following euthanasia, intestinal tissues were collected and mounted in modified Ussing chambers to determine basal short-circuit current (Isc), and to determine the capacity for active glucose, phosphorus, glutamine, and glycyl-sarcosine absorption in each portion of the intestine based on changes in Isc following the addition of 10 mM of each compound to the mucosal buffer. Chambers were osmotically balanced by adding mannitol to the serosal buffer. Finally, carbachol was added to the serosal buffer to test for chloride secretory ability. Basal Isc and active glutamine absorption were not different (P>0.10) between intestinal sections. Active glucose absorption tended (P<0.10) to be higher in the ileum than the proximal jejunum and right ventral colon with the distal jejunum being intermediate. Phosphorus absorption was higher (P<0.02) in the right ventral colon (18.45 $\mu A/cm^2$) compared to the proximal (7.9 $\mu A/cm^2$) and distal jejunum (10.3 $\mu A/cm^2$) and ileum (7.3 $\mu A/cm^2$). Greater active absorption (P<0.05) of the di-peptide glycyl-sarcosine was observed in the distal jejunum and right ventral colon compared to the proximal jejunum, with the ileum being intermediate. Secretion of chloride ion, following a serosal carbachol challenge, was greater (P<0.01) in the right ventral colon (19.07 $\mu A/cm^2$) compared to the proximal (3.97 $\mu A/cm^2$) and distal jejunum (4.96 $\mu A/cm^2$) and the ileum (3.04 $\mu A/cm^2$). Based on the results of this experiment, the importance of each section of the intestine differs depending on the nutrient being evaluated.

Key Words: Nutrient, Absorption, Equine

TH94 Genistein reduces LPS stimulated TNFα release from equine monocytes. A. R. Taylor* and J. A. Clapper, *South Dakota State University, Brookings*.

Endotoxemia is often manifested by an overproduction of circulating proinflammatory cytokines, such as tumor necrosis factor-α (TNF) in response to lipopolysaccharide (LPS). Genistein is a non-steroidal tyrosine kinase inhibitor that has been shown to decrease the release of TNF from circulating monocytes in response to LPS. To further examine if genistein could be used to reduce LPS stimulated TNF release in the horse the following experiment was performed. Blood (180 mLs) was collected by jugular venipuncture from a mature healthy gelding and the isolated leukocyte rich plasma was layered over Histopaque 1077 and centrifuged to obtain an enriched monocyte population. Monocytes were washed twice in sterile PBS, counted, and diluted to 1 x 10^7 cells/mL in RPMI 1640. Monocytes were then added to polystyrene tubes (4 x 10^6 cells/tube) and incubated at 37°C in 5% CO_2 for 2 h to allow monocytes to adhere. Non-adherent cells were decanted and monocytes were covered with RPMI 1640 containing 1% FBS and 0, 1 pM, 1 nM, 10 nM, 1 μM and 10 μM genistein and incubated an additional hour at 37°C in 5% CO_2. Media was then replaced with media containing the various concentrations of genistein with and without 100 pg/mL LPS (E. coli O55:B5) and incubated for 6 h at 37°C in 5% CO_2 after which the supernatants were collected by centrifugation and frozen at -80°C until assayed for TNF by ELISA. Triplicate tubes were prepared for each genistein-LPS combination. Differences in supernatant concentrations of TNF-α were determined using the Proc Mixed procedure of SAS. Supernatant concentrations of TNF in tubes containing no LPS were not different (P>.05) and were at the detection limit of the assay. Supernatant concentrations of TNF decreased (P<.05) as genistein concentrations increased. Tubes containing 1 and 10 μM genistein produced less (P<.05) TNF than the 1 pM and 1 nM tubes in response to LPS, however, they were not different (P>.05) than LPS alone. These preliminary data suggest that genistein may be beneficial in reducing TNF release in response to LPS in the horse.

Key Words: Equine, Genistein, LPS

TH95 Effect of exercise and superoxide dismutase on systemic antioxidants and nitric oxide in horses. E. D. Lamprecht*, C. A. Bagnell, and C. A. Williams, *Rutgers, The State University of New Jersey, New Brunswick*.

J. Anim. Sci. Vol. 86, E-Suppl. 2/J. Dairy Sci. Vol. 91, E-Suppl. 1

433

The main objectives were to evaluate effects of exercise and oral super-oxide dismutase (SOD) supplementation on systemic antioxidant status and nitric oxide (NO) in horses. Standardbred mares (n = 12) were used in this double blind, randomized crossover design. Horses were assigned to a treatment (TRT; 3 g/d of oral SOD powder with 3000 IU) or placebo (CON; 3 g/d cellulose powder) group. Mares were supplemented for 6 wks, completed a 6 wk wash-out period and were crossed over for another 6 wk supplementation. A repeated sprint exercise treadmill test (RSET) was conducted on d 28 (RSET 1,3) and d 42 (RSET 2,4) during each phase. Blood samples were collected before exercise (PRE), at peak effort (PEAK), 30 min, 2h, 4h, 24h, and 36h post exercise (POST). Samples were analyzed for plasma NO, erythrocyte total glutathione (tGSH) and glutathione peroxidase (GPx). Data were analyzed using a mixed model ANOVA with repeated measures in SAS. Results showed main effects for exercise test and sample time. Nitric oxide was higher for RSET 1 and 2 (P < 0.01) compared to RSET 3 and 4. A decrease in NO between 30 min POST and 4h POST (P < 0.01) was followed by an increase at 36h POST to pre-exercise values (P < 0.01). Relative to the other RSET, tGSH was lower (P = 0.051) and GPx activity was higher (P < 0.01) during RSET 4. Both tGSH (P < 0.01) and GPx (P < 0.01) were higher at PEAK compared to all other samples. No treatment effect of SOD was detected. Decreased NO levels for RSET 3 and 4 and increased GPx activity during RSET 4 may reflect a physiological adaptation to exercise or a change in reproductive hormone profile due to seasonal variation between trial phases. The NO peak at 36 h POST may indicate a delayed pro-inflammatory response to tissue microdamage. Elevated levels of tGSH and GPx at PEAK may be a compensatory antioxidant response to exercise-induced oxidative stress. Sample analysis for systemic SOD concentration and other markers of inflammation and oxidative stress is currently underway to identify benefits of oral SOD supplementation in horses.

Key Words: Equine, Oxidative Stress, Exercise

TH96   Evaluation of plasma alpha-tocopherol daily within-horse variation. P. D. Siciliano*, L. E. Dowler, and S. E. Pratt, *North Carolina State University*, *Raleigh*.

Two experiments were conducted to evaluate plasma alpha-tocopherol concentration (TOC) daily within-horse variation (Exp. 1) and to determine the effect of a single meal on plasma TOC (Exp. 2). In Exp. 1 venous jugular blood samples were collected from 4 pregnant (mo 6 to 7 of gestation) mares of light horse breeding (5 to 11 yr of age) between 730 and 830 followed by 8 hourly samples and analyzed for plasma TOC. All horses were fed 5 kg DM of grass hay 18 h prior to sample collection and received no additional feed during the sampling period. Water was always available. Results were analyzed using ANOVA for repeated measures design. Mean (± SD) plasma TOC over the sampling period for horses 1, 2, 3, and 4 was 3.75 ± 0.20, 4.72 ± 0.15, 4.23 ± 0.11 and 3.99 ± 0.12 μg/ml, respectively and was unaffected by time. In Exp. 2 seven horses 4 mares and 3 geldings of light horse breeding (3 to 12 yr of age) were randomly assigned to 1 of 2 treatments followed by reversal of treatments 24 h later: fasted (FST; n = 7) or fed (FD; n = 7). At 730 FD horses were offered 2.1 kg DM of grain-mix-concentrate (187 IU vitamin E/kg DM) plus 3.3 kg DM mixed grass hay while FST horses received no feed. Neither group received any feed for the period 18 h prior to 730. Venous jugular blood samples were collected at 1030 from all horses and analyzed for plasma TOC. Results were analyzed as a paired t-test using the PAIRED statement of SAS. The mean (± SD) within horse paired treatment difference was not significant (0.05

± 0.12 μg/ml). The results suggest within horse plasma TOC does not vary significantly over an 8-hr period in fasting horses and is unaffected 3 h following a hay grain meal.

Key Words: Alpha-Tocopherol, Horse, Vitamin E

TH97   Effect of selenium supplementation and dietary energy manipulation on mares and their foals: Foaling parameters and foal physical characteristics. B. J. Karren*[1], J. F. Thorson[2], C. A. Cavinder[1], C. J. Hammer[2], and J. A. Coverdale[1], [1]*Texas A&M University*, *College Station*, [2]*North Dakota State University*, *Fargo*.

To investigate maternal plane of nutrition and role of Se yeast on foaling parameters and physical characteristics of foals, 28 Quarter Horse mares were utilized in a randomized complete block design. Mares were blocked by expected foaling date and assigned randomly within block to dietary treatments. Dietary treatments were arranged as a 2x2 factorial with two levels of nutrition, pasture or pasture plus grain (fed at 0.75% BW) and two levels of Se supplementation (0 or 0.3 mg/kg BW) equaling four treatment groups: pasture (P), pasture + grain (PG), pasture + grain + Se (PGS), or pasture + Se (PS). P and PS mares received approximately 100% of calculated NRC DE requirements, while PG and PGS received 120%. Selenium supplementation began 110 d prior to estimated foaling (d 0) and all dietary treatments were terminated at parturition. At parturition foaling parameters: time of water break to birth, time to stand, time to nurse, and time of birth to placenta expulsion were recorded. Colostrum samples were collected and quality estimated via refractometer and colostrometer. Placenta weight, foal birth weight, foal wither and hip height, foal body length, and total length of gestation were recorded. All data were analyzed using PROC GLM of SAS. Time of water break to birth, time to stand, time to nurse, time of birth to placental expulsion, placental weight, foal birth weight, wither and hip height, and body length were not affected (P > 0.10) by nutrition or Se supplementation. However, PG and PGS mares had greater BW (P < 0.03) prior to foaling, and greater colostrum refractometer values (Brix %) (P = 0.01). There was a nutrition x Se interaction (P = 0.01) with PGS mares having the shortest gestational length and PS mares having the longest. These data indicate that maternal plane of nutrition but not supplemental Se effects BW and colostrum quality (Brix %) of mares. Additionally, the interaction between nutrition and Se supplementation may affect gestational length. Despite differences in nutrition and Se supplementation there was no difference in foaling parameters or foal physical characteristics.

Key Words: Se, Foaling

TH98   Effect of selenium supplementation and dietary energy manipulation on mares and their foals: Placental dynamics. J. F. Thorson*[1], B. J. Karren[2], M. L. Bauer[1], C. A. Cavinder[2], J. A. Coverdale[2], and C. J. Hammer[1], [1]*North Dakota State University*, *Fargo*, [2]*Texas A&M University*, *College Station*.

To investigate maternal plane of nutrition and role of Se yeast on placental dynamics, 28 quarter horse mares were used in a randomized complete block design. Mares were blocked by expected foaling date and assigned randomly within block to dietary treatments. Dietary treatments were arranged as a 2×2 factorial with two levels of nutri-

434

J. Anim. Sci. Vol. 86, E-Suppl. 2/J. Dairy Sci. Vol. 91, E-Suppl. 1

tion, pasture or pasture + grain (fed at 0.75% BW) and two levels of Se supplementation (0 or 0.3 mg/kg BW). This resulted in four treatments: pasture (P), pasture + Se (PS), pasture + grain (PG), and pasture + grain + Se (PGS). P and PS mares received approximately 100% of calculated NRC DE requirements, while PG and PGS received 120%. Selenium supplementation began 110 d prior to the estimated foaling (d 0) and all dietary treatments were terminated at parturition. At parturition, placental expulsion time and weight were recorded and two samples collected. Placental samples were placed in cryogenic vials, snap frozen in liquid nitrogen, and stored at -60°C until DNA, RNA and protein analysis. Samples were analyzed for concentrations of DNA and RNA using the diphenylamine and orcinol procedures. Protein in tissue homogenates was determined with Coomassie brilliant blue G, with bovine serum albumin as the standard. Concentration of DNA was used as an index of cell number, with protein:DNA and RNA:DNA ratios used as indices of cellular size and potential activity, respectively. All data were analyzed using a GLM model of SAS. There was no effect ($P \geq 0.20$) of Se or level of nutrition on cell number, potential cellular activity, placenta expulsion time, or placental weight. However, mares supplemented with Se had decreased ($P = 0.02$) placental cell size (32.50 mg protein/mg DNA) compared to mares not supplemented with Se (24.14 mg protein/mg DNA). Results indicate Se supplementation reduced cellular size without deviation in cell number or gross placental weight, while maternal plane of nutrition did not affect any placental parameters measured. Further studies are needed to understand the physiological significance of a reduced placental cellular size.

Key Words: Equine, Placenta, Selenium

TH99   Digestible energy requirements of two and three year old fillies receiving light exercise. J. E. Ringler*, B. D. Cassill, K. C. Watson, S. Hayes, and L. M. Lawrence, *University of Kentucky, Lexington*.

The National Research Council (NRC, 2007) recently published a method for calculating the digestible energy (DE) requirements of growing horses receiving regular exercise. The method uses equations based on body weight (BW), age, average daily gain (ADG), and activity level. This study compared actual DE intakes of young horses receiving regular exercise to the DE requirements predicted using the NRC (2007) equations. Six fillies (five 2 year olds and one 3 year old, average BW of 450 kg) were individually housed and fed during four experimental periods (P), 35, 36, 25, and 28 d in length, respectively. Alfalfa cubes were offered at 1.4% BW in P1 and 1.5% BW in P2, P3, and P4. The amount of concentrate was adjusted to produce an ADG of approximately 0.2 kg/d. During P1 all fillies received the same concentrate; in P2, P3, and P4 fillies received either the P1 concentrate or one of two other concentrates, which were assigned as part of a different study. All fillies received the same light exercise (averaging 5 mph for 40 min, 5d/wk). Daily DE intakes and predicted DE requirements were averaged by period and horse and compared using paired t-tests. When individual horse data were averaged by period, the actual DE intakes (Mcal/d) were 21.1 (P1), 24.6 (P2), 24.7 (P3), 24.0 (P4), and were not different from the predicted requirements of 22.3, 23.2, 23.8, and 23.9, respectively (P>0.128). When averaged within horse, the actual and predicted DE requirements (Mcal/d) were: Horse 1: 24.7 and 24.2 (P=0.544); Horse 2: 21.8 and 20.6 (P=0.511); Horse 3: 24.1 and 22.5 (P=0.405); Horse 4: 24.1 and 21.7 (P=0.102); Horse 5: 21.7 and 22.2 (P=0.509); and Horse 6: 25.2 and 28.5 (P=0.263), respectively. Predicted values ranged from 90.0 to 113.1% of the actual values. While a small number of horses were used, data from this study suggest the NRC (2007) equations predict the average actual DE requirements of two to three year old horses receiving light exercise, but that differences among individuals exist.

Key Words: Growth, NRC Equation, Prediction Equation