

fold increase ($P = 0.0004$). When myotube cultures were exposed to a dose response titration of leucine from 0- μM to 408- μM muscle protein synthesis was increased as a result of leucine treatments with significant differences observed at 204- μM and 408- μM leucine compared with the control cultures. These treatments levels exhibited a 1.6-fold increase in protein synthesis when compared with the untreated control ($P \leq 0.02$) but were not different from each other. These results show that leucine can activate the mTOR pathway and increase protein synthesis in equine satellite cells *in vitro*.

Key Words: skeletal muscle, Western blot, horse

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The effect of hay:concentrate ratio on nitrogen balance and plasma amino acids in exercising horses



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Four horses (590 \pm 12 kg) were used to evaluate the effect of hay:concentrate ratios on nitrogen balance and plasma amino acids in exercising horses. Horses were fed timothy hay and a oats/corn/soybean meal concentrate to meet nutrient requirements for light to moderate exercise in ratios of 100:0, 80:20, 70:30 and 60:40 hay to concentrate. Horses participated in exercise 1–2 h 5 d per week. The respective diet was fed for 14 d followed by a 4 d period for total collection of feces and urine to calculate nitrogen balance. Blood samples were taken before feeding, and at 1, 3 and 6 h post feeding for analysis of amino acids and urea nitrogen. At the end of the collection period, diets were switched and the protocol repeated until each horse completed each treatment. Data were analyzed using the PROC MIXED procedure of SAS. Nitrogen intake was 189 \pm 5 g N per day (1,181 \pm 31g CP per day). There was no effect of treatment on nitrogen intake, digestibility or urine nitrogen loss. Fecal nitrogen loss was lower ($P = 0.024$) while nitrogen retention had a tendency to be higher ($P = 0.068$) for horses fed the 100:0 ratio compared with the 60:40 ratio. Plasma urea concentrations and urea index were lower for horses fed the 100:0 ratio compared with the 60:40 ratio ($P = 0.029$ and $P = 0.002$ respectively). Amino acid intake was not affected by treatment except lower intakes for lysine, histidine and arginine for the 100:0 ratio diet compared with other treatments ($P < 0.05$). Plasma histidine was lower for horses fed the 100:0 ratio ($P = 0.017$) compared with other treatments. Plasma leucine was higher in horses fed the 100:0 ratio ($P = 0.0043$) compared with horses fed the 70:30 or 60:40 ratio. Plasma phenylalanine and plasma lysine were higher in horses fed the 100:0 ratio compared with other treatments ($P = 0.0022$ and $P = 0.003$ respectively). There was no effect of treatment on other plasma amino acids. It seems counter to other studies that horses fed higher hay amounts would have lower fecal nitrogen loss as well as a tendency for higher nitrogen retention. Evidence provided by lower plasma urea nitrogen and lower urea index in this study for horses fed the 100:0 ratio diet suggests that there was better utilization of the nitrogen and amino acids for the all forage diet compared with other forage:concentrate ratios. All horses received crude protein in excess of requirements based on current NRC recommendations. For horses on treatments that included concentrate, these excesses would have been readily available in the foregut and may have contributed to the higher plasma urea nitrogen and urea index observed in these treatment groups.

Key Words: forage, concentrate, nitrogen balance

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In vitro dry matter digestibility of forages incubated with DigestaWell Fiber



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Enhanced microbial fermentation of feedstuffs in the equine large intestine would improve nutrient extraction, decrease waste, and increase the value of low quality forages. Supplying the microbiota with cofactors required for fermentation may improve their efficiency. The objective of this study was to examine the effect of DigestaWell Fiber (DF; fibrolytic cofactors: methionine and B vitamins) on the activity of equine hindgut organisms and their capacity to digest forages. Four forages (2 grass, 2 legume) ranging in NDF and ADF content were selected for the study: tall fescue hay (TF; 71.3% NDF, 38.3% ADF, DMB); timothy hay (TH; 58.5% NDF, 40.2% ADF); mature alfalfa hay (MA; 46.2% NDF, 34.7% ADF) and early maturity alfalfa hay (EA; 38.9% NDF, 26.5% ADF). Dry matter digestibility (DMD) was determined following 24 and 48h incubations carried out in a 4-vessel ANKOM Daisy II incubator at 37°C using 200g fresh equine feces inoculum. Ground forages were pre-weighed into ANKOM F57 filter bags in triplicate for each treatment condition and placed in the vessels after the inoculation media. The 4 treatment conditions were 24 and 48h incubation with no additive or with DF (320mg/1L incubation vessel). Each vessel also contained 2 empty bags for the calculation of a correction factor associated with bag weight change during incubation and drying. Following each incubation, the bags were removed from the vessels, rinsed and dried to constant weight for determination of DMD. The procedure was repeated 5 times with feces from different donor horses. Data were analyzed with PROC GLM within incubation time with main effects of treatment, forage and repetition. DMD differed among forages ($P < 0.05$) and across incubations, the TF had the lowest DMD and the EA had the highest DMD. In both 24 and 48h incubations, DMD was inversely related to NDF concentration ($R^2 = 0.99$ at 24 and 48h) and ADF concentration ($R^2 = 0.68$ at 24h, $R^2 = 0.7$ at 48h). Across all forages for the 24h incubations, the mean DMD for the DF and untreated vessels were 43.0 and 41.9%, respectively ($P > 0.1$). However, for the 48h incubations, DMD was higher ($P < 0.03$) for forages in DF vessels (57.5%) than in control vessels (56.1%). Additionally, DF improved (35.3 vs 31%; $P < 0.005$) ADFD at 48h incubations for TF. Variations in DMD were noted among replicates, suggesting differences in the microbial inoculum obtained from different donors. These results suggest that the activity of equine hindgut microorganisms may be enhanced by DF with a resulting increase in DMD. Further research should investigate effects on other feeds as well as different donor animals.

Key Words: fiber, digestibility

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Quantification of dietary and fecal particle size



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Dietary particle size (DPS) and concepts like physically effective fiber (PEF) are relatively unexplored topics in equine nutrition. Studies in dairy cows highlight the role of PEF in maintaining an optimal ruminal environment. Exploring benefits of including whole oats with PEF in equine diets may help reduce the risk of