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Advances in Equine Nutrition

Volume II

Edited by

J.D. Pagan

APPARENT DIGESTION OF HAY/GRAIN RATIONS IN AGED HORSES-REVISITED

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Research on digestion in aged (> 20 yrs old) Quarter Horse and Thoroughbred horses in the mid-1980s revealed that the population studied at that time had reduced apparent digestion of protein, phosphorus and fiber relative to younger horses fed pelleted alfalfa (Ralston et al., 1989). The digestive profile of the aged horses was very similar to that reported for horses which had had 90% resection of the large colon (Bertone et al., 1989a and 1989b).

In two subsequent digestion trials on aged horses conducted in New Jersey in the 1990s, the reductions of digestibility, especially in protein, were not as apparent. In trial 1, conducted in 1990, eight light horse mares > 19 years old were used in a simple crossover design to compare digestibility of a commercial textured sweet feed (OM) and one formulated specifically for aged horses (ES). The grains were fed in amounts calculated to provide 50% of the recommended caloric requirements (NRC, 1989) for maintenance, with the rest of the ration being provided as long stem hay. The mares were adapted to the rations for 2 weeks and then subjected to a standard 5-day digestion trial, during which intake was recorded and all feces were collected and weighed, with subsamples taken for nutrient analyses at a commercial laboratory (DHIA, Ithaca, NY). There were differences in apparent digestibility between the two rations. Protein, calcium and phosphorus intakes were higher in ES fed horses than in the OM. Mares on the OM were, as previously reported in aged horses, in low to negative phosphorus balance (-8.1%±4.3) but were in positive balance on the ES (13.3%±4.4). Calcium apparent digestion was also higher in ES fed horses (OM: 10±6; ES: 33±4, $p<.05$). Crude protein apparent digestion in OM fed mares was lower (OM: 63.9±1.0; ES: 71.5±0.7, $p<.05$); however it was still within the normal range of protein apparent digestion reported for horses. The differences between the two rations were probably due to the higher protein, calcium and phosphorus intake in the ES ration (Table 1).

In trial 2, conducted in 1995, 15 aged Standardbred mares were used in a trial comparing daily injections with equine somatotropin (eST). They were fed OM and mixed hay in amounts calculated to provide 120% recommended intakes (NRC, 1989). Results of this trial have been reported previously (Ralston et al., 1996). However, it is important to note that protein, phosphorus and calcium apparent digestion were within normal limits regardless of treatment (Table 2). The reduction in large intestinal absorption observed previously (Ralston et al., 1989) was not apparent, despite similar types of hay (timothy grass mix) and grain (OM).

Table 1. Total ration nutrient composition of rations fed in aged horse digestion trials (all values on dry matter basis).

Date	1989	1990 OM	1990 ES	1995
Crude protein	16%	10%	12%	13%
Crude fiber	22%	NA	NA	NA
Acid detergent fiber	NA	28%	32%	28%
Neutral detergent fiber	NA	49%	55%	39%
Calcium	1.2%	0.3%	0.5%	0.8%
Phosphorus	0.3%	0.3%	0.4%	0.3%

NA=not reported

Table 2. Covariately adjusted least squares means for percent apparent digestibilities of nutrients in aged mares given daily equine somatotropin (eST).[1]

Nutrient	eST (mg/day)			
Dry matter	56.6±1.8	61.5±2.0	63.8±0.04	0.23
Crude protein	64.8±2.5	70.3±2.9	69.5±0.31	0.23
Acid detergent fiber	33.9±2.8	30.3±3.2	41.8±2.4	0.04
Neutral detergent fiber	27.9±2.5	33.2±2.8	37.7±2.1	0.06
Calcium	53.3±5.7	46.9±6.6	54.1±5.6	0.69
Phosphorus	14.4±5.3	13.6±6.4	13.2±4.8	0.98

[1]Pretreatment (30 days prior to eST injection) was used as the covariate for day 22. N = 4, 3 and 5 for 0, 6.25 and 12.5 mg eST, respectively.

Comparing results of digestion trials which used different feeds, horses and conditions is somewhat risky. However, the same investigator (SLR) performed the trials and used exactly the same techniques in all 4 studies relative to the collection of feces, etc. The initial 1989 trial used straight alfalfa pellets as the basal ration which was higher in protein and calcium and equivalent in phosphorus relative to the rations used in subsequent studies (Table 1). If anything, the later studies should have shown lower digestion of these nutrients relative to the 1989 report. Both trials in the 1990s were conducted at the same facility and the phosphorus intakes in all trials were similar (Table 1). Therefore, the consistently positive phosphorus digestion in the 1995 study relative to the low to negative balance seen in OM horses in the 1989 and 1990 studies suggests a difference

between the two populations of aged horses. One potentially significant difference between the studies was that the horses in both studies in the 1990s were in fair to good body condition with no major dental abnormalities, in contrast to the 1989 report, wherein 3 of the 7 aged horses were reported to have weight loss and/or poor dentition. In a field comparison of ES to a standard textured feed (Ralston and Breuer, 1996), it was noted that old horses in poor body condition received the most benefits from the "senior" formulation.

Another potential contributing factor to differences seen between the studies in aged horses may be improved gastrointestinal parasite control in the horses used in the later studies. Migrating *Strongylus vulgaris* larvae cause "verminous aneurysms" which result in thromboembolic lesions and scarring, especially in the large intestine (Drudge and Lyons, 1989). Effective, safe larvicidal anthelmintic administration was not a common practice until the late 1970s and early 1980s (Drudge and Lyons, 1989). The mares used in the original study had been born in the mid- to late-1960s and had not had larvicidal anthelmintics administered until already aged, if at all. The horses in the last two studies, born in the mid-1970s, had the benefit of larvicidal anthelmintic administration for most, if not all, of their lives. It is hypothesized that the reduction in apparent digestion of protein, phosphorus and fiber reported previously in aged horses may have been due in part to chronic parasitic damage to the large colons and/or abnormal dentition rather than caused by aging per se.

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