DIGESTIBLE ENERGY REQUIREMENTS OF LACTATING PONY MARES

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Introduction

The National Research Council's (1978) estimates of the energy requirements for lactation are based primarily on theoretical calculations. Some experiments have evaluated the accuracy of these recommendations (Jordan 1979; Sutton 1977), but in these studies not only was the digestible energy adjusted to different levels, but all of the other nutrients as well. That is, the same ration was fed to each treatment group with only the level of intake being altered.

This study was conducted to evaluate the effects of feeding rations that were adjusted to provide 80, 100 or 125% of the NRC DE recommendations (200 kg. mature wt.), while providing 100% of the NRC protein requirement and adequate amounts of calcium and phosphorus.

Procedure

Twenty-two lactating pony mares were fed one of three complete pelleted rations for 12 weeks. Each pair of mare and foal were housed and fed individually in box stalls. Foals were not allowed to eat any of the mare's ration. Prior to parturition the mares were stratified according to body condition as determined by ultrasonic measurements and weight, and randomly assigned to treatment. The digestible energy content of the diets (table 1) were determined in a 3x3 latin square design trial with mature pony geldings fed at a rate of 1½ kg. per 100 kg. of body weight.

The intakes were adjusted according to the body weight of the mare shortly after parturition. It was found, however, that the weight of the mare about 2 weeks after parturition was a better reference weight for the mare as most of the mares regained weight rapidly during the first two weeks following parturition. Jordan (1977) observed similar weight recoveries.

The mares and foals were weighed weekly. Heart girth and height at withers of the foals were measured weekly.

Each foal was weighed on the same day each week. Thus, the weigh dates when expressed as days after foaling varied among foals. The weight gains were plotted and data obtained from the plots were used for statistical analysis. Analyses of covariance using reference weight of the mare and birth weight and birth measurements of foals were used when appropriate. The data are expressed as adjusted means.

Results

When the diets were fed at a level that would provide 100% of the NRC requirement for crude protein, diet one (medium) provided 103% of the NRC DE recommendation, diet two (high) provided 128% NRC DE, and diet three (low) provided 79% of the recommended energy level. These digestible energy contents were calculated using data from the digestion trials, and may be higher than what the mares actually received due to a possible digestibility depression caused by higher levels of intake of the mares.

The weight changes of the mares are shown in table 2 and figure 1. As mentioned earlier, the mares gained weight rapidly during the two weeks following parturition. Mares fed the low energy lost weight during the experimental period. Mares fed medium or high levels gained weight.

The weight gains of the foals are shown in table 3 and figure 2. The gains were similar for all three groups until week 7. After week 7, foals of mares fed the low energy gained at a slightly slower rate ($p < .15$).

Foals of mares fed the low energy ration had smaller heart girths than foals of mares fed the medium energy ration. No differences in height due to treatment were observed.

Discussion

The results clearly demonstrate that the low energy intake was inadequate for maintenance of body weight of mares. Apparently the mares fed the low energy produced less milk energy because their foals did not grow as fast as the other foals during the latter part of the experiment.

The significance of the weight loss of the mare is unknown. That is, should mares maintain body weight during lactation, or is some weight loss acceptable or perhaps even desired? Furthermore, the weight gains of the foals after 7 weeks could perhaps be more efficiently supported by creep feeding rather than by increasing milk production of the mare by increasing her energy intake.

The mares fed the medium or high levels of energy gained weight which suggests that the energy intakes were greater than that needed for their maximum milk production. Perhaps the weight gains could be beneficial because it has been suggested that "putting mares in a gaining state" during breeding season may improve chances of conception (Ott, 1972).

The failure to find differences in weight gains between mares fed the medium and high energy levels is difficult to explain. No differences were found in the weight gains of the foals, thus the extra energy fed to the high energy group did not appear to be transferred to the foals. Weight gains could be of different energy composition. That is, the mare fed the high energy diet may have deposited more calories in the form of fat even though they did not gain more weight. Or perhaps

the protein:calorie ratio in the high energy ration resulted in inefficient energy utilization.

When maintenance of body weight of the mare and growth rate of foals are used as the criteria to establish energy requirements of lactating pony mares, the NRC estimates appear high. Our data suggest that a level of 85-90% of the NRC estimates would satisfy the above criteria.

Literature Cited

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TABLE 1. Composition and Level of Intake of the Test Diets.

Diet 1 (medium diet)	40% Alfalfa Meal 53% Corn 7% Soybean Meal	3.48 Mcal DE/kg D.M. 17% Crude protein Level of Intake - 2.40 kg/100kg B.W.
Diet 2 (high energy)	34% Alfalfa Meal 63% Corn 3% Soybean Meal	3.55 Mcal DE/kg D.M. 13.5% Crude protein Level of Intake - 2.97 kg/100 kg B.W.
Diet 3 (low energy)	47% Alfalfa Meal 37% Corn 16% Soybean Meal	3.39 Mcal DE/kg D.M. 20.5% Crude protein Level of Intake - 1.91 kg/100kg B.W.

TABLE 2. Adjusted[1] Mare Weight Change from Reference Weight[2]

Treatment	Diet 1	Diet 2	Diet 3
Energy level	103% NRC (medium)	128% NRC (high)	79% NRC (low)
No. Mares	8	6	8
Mare Ref. Wt.(kg)	199.3	193.4	183.4

Weeks after Foaling	Weight Change (kg) (medium)	(high)	(low)	Significance Probability treat. 1 vs treat. 2	treat. 1 vs treat. 3
0	-5.51	-10.33	-4.43	.16	.73
1	-2.38	-.01	.27	.06	.02
2	-.79	1.27	-1.24	.18	.75
3	-2.64	1.67	-4.20	.03	.36
4	.88	3.23	-3.66	.42	.11
5	1.98	6.49	-5.21	.17	.03
6	3.06	8.32	-5.72	.11	.01
7	4.97	8.57	-7.08	.21	.00
8	5.73	10.69	-7.68	.12	.00
9	7.71	11.28	-7.59	.21	.00
10	9.59	10.03	-6.95	.89	.00
11	11.81	13.80	-7.14	.58	.00

[1]Treatment means were adjusted using individual mare reference weights as covariates.

[2]The reference weight of the mare is the weight at which feed intake was calculated. This was the first or second week weight.

TABLE 3. Adjusted[3] Cumulative Weight Gains in Foals (kg.)

Treatment	Diet 1	Diet 2	Diet 3		
Energy level	103% NRC (medium)	128% NRC (high)	79% NRC (low)		
No. of foals	7[4]	6	8		
Birth Wt.(kg.)	20.9	19.5	21.3		
Weeks after Foaling	Weight Gain (kg.) (Medium)	(High)	(Low)	Significance treat. 1 vs. treat. 2	Probability treat. 1 vs. treat. 3
1	3.7	3.5	3.9	.74	.77
2	7.1	6.8	7.9	.78	.55
3	10.7	9.5	11.4	.50	.68
4	14.5	12.0	13.9	.25	.80
5	17.0	14.8	16.7	.28	.86
6	19.0	17.2	19.9	.45	.68
7	21.6	19.7	21.6	.45	.99
8	24.8	23.0	22.7	.49	.43
9	27.0	24.8	23.8	.40	.23
10	29.3	27.0	25.2	.43	.18
11	31.1	28.4	26.1	.42	.15

[3] Treatment means were adjusted using individual mare reference weights and individual foal birth weights as covariates.

[4] One of the treatment one foals became sick during the trial, so its growth measurements were not included in the results.

figure 1. MARE WEIGHT CHANGE

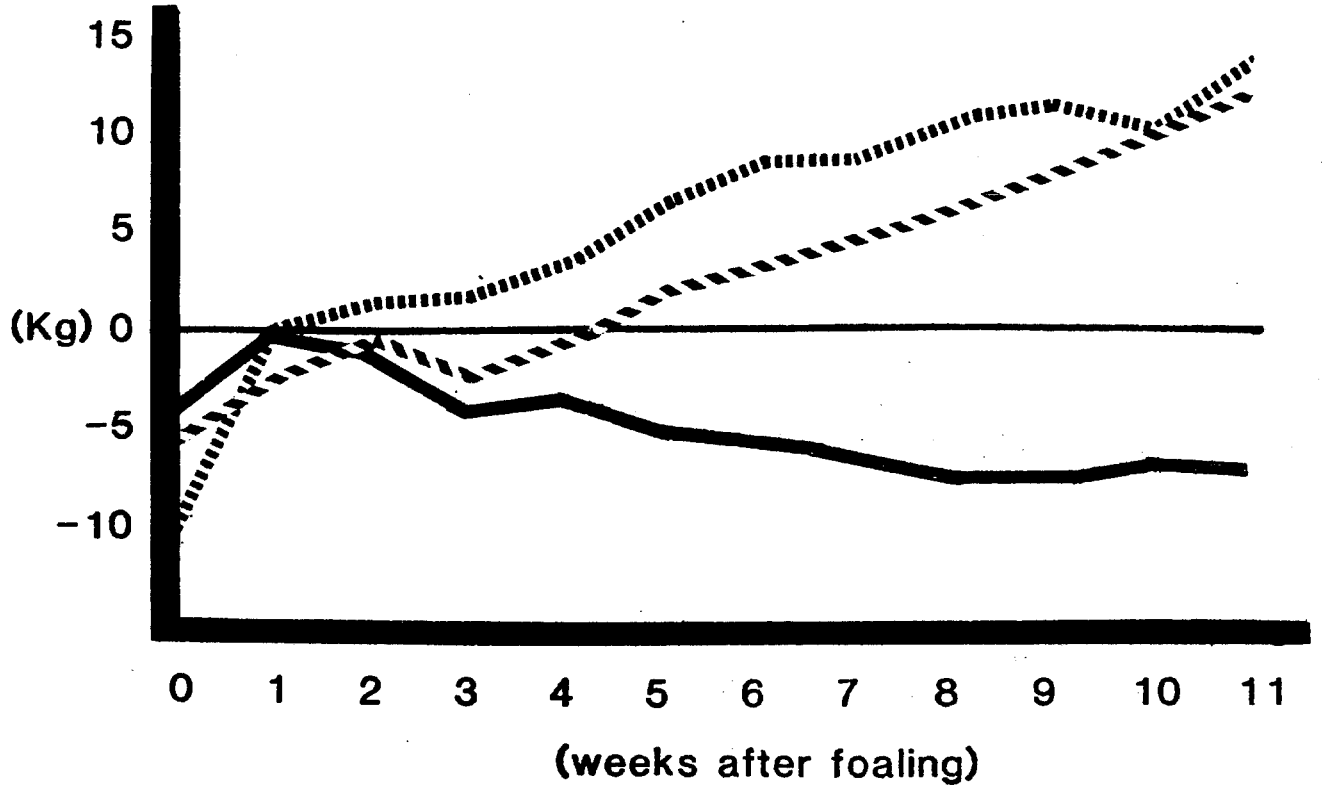

figure 2. FOAL WEIGHT GAIN