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Effects of Rations and Age on Mineral Concentrations of Thoroughbred Mare's Colostrum

Yo ASAI*, Ryoji KATSUKI, Akira MATSUI, and Yasuo NANBO

Equine Research Institute, Japan Racing Association, 5-27-7 Tsurumaki, Setagaya-ku, Tokyo 154, Japan

Colostrum samples were collected from 12 Thoroughbred mares (6-15 years old) at 3 farms located in Hidaka district, Hokkaido, Japan, to clarify the effects of rations and age on calcium, copper and zinc concentrations in mare's colostrum. Average concentrations of all colostrum calcium, copper and zinc were 82.8 mg/dl, 0.82 ppm and 7.76 ppm, respectively. Calcium, copper and zinc contents of rations for mares before parturition varied with the farms. However colostrum calcium, copper and zinc concentrations were not different among the farms. There were significant negative correlations between age of mares and colostrum copper or zinc concentrations. It is suggested that copper and zinc intakes of the newborn foals born from older dams may diminish.

Key words: colostrum, mineral, Thoroughbred mare

J. Equine Sci.
Vol. 6, No. 1
pp. 21-24, 1995

Many articles have shown the relationship between the incidence of bone malformation and mineral nutrition in growing horses [1, 4, 5, 7, 10]. These disease (DOD: developmental orthopedic disease) are also found in nursing foals [4, 9, 10]. Colostrum may contain more minerals and play an important role for normal bone growth of neonatal foals. However there are few informations affecting mineral concentrations in mare's colostrum. The object of this study is to investigate the effects of rations and age on calcium, copper and zinc concentrations of Thoroughbred mare's colostrum which are essential for normal bone growth of foal.

Colostrum samples were collected from 12 Thoroughbred mares (6-15 years old) within a few hours after parturition at 3 farms (A, B and C) located in Hidaka district, Hokkaido, Japan. Samples were frozen before analysis. Five ml of colostrum samples were digested in 20 ml of nitric acid and 10 ml of perchloric acid on a hot plate (200°C). After digestion, the concentrations of colostrum calcium, copper and zinc were deter-

mined by the atomic absorption spectrophotometry [11].

The composition of feedstuffs for mares at each farm before parturition is shown in Table 1. Calcium, copper and zinc contents in daily rations were calculated by the values previously reported [1]. Compared with NRC recommendation [12], dietary copper content was insufficient in B and C farms and zinc content was insufficient in C farm.

Average concentrations of all colostrum calcium, copper and zinc were 82.8 mg/dl, 0.82 ppm and 7.76 ppm, respectively (Table 2). Ullrey *et al.* reported that colostrum calcium, copper and zinc concentrations of Arabian and Quarter Horse were 84.7 mg/100 g (specific gravity: 1.076) [15], 0.99 ppm and 6.4 ppm [14], respectively. Oshima and Fuse [13] reported that colostrum calcium concentration of Thoroughbred was 86.5-108.6 mg/dl in Japan. It seemed that our results were almost similar to the values of these reports.

Although calcium contents in feedstuffs of A and C farms were higher than those of B farm, colostrum calcium concentration in each farm was not affected by dietary intake of calcium. Colostrum copper concentration of A farm, where copper contents in feedstuffs was highest, was not diffe-

This article was submitted February 3, 1995, and was accepted April 17, 1995.

*corresponding author.

Table 1. The composition of daily feedstuff for mares at each farm before parturition

	Farm			NRC Recommendations ³⁾
	A	B	C	
Ingredients (kg/day) ¹⁾				
oats	0.5	3.0	2.5	
pelleted concentrate	1.7	—	—	
wheat bran	0.6	0.3	—	
timothy hay	8.5	11.0	3.0	
alfalfa hay	0.7	—	7.0	
mineral supplements	much	moderate	moderate	
Nutrient ²⁾				
calcium (g/day)	95	45	110	50–60
copper (mg/day)	360	35	65	120–140
zinc (mg/day)	1040	510	225	480–570

1) As fed basis. 2) Dry matter basis. 3) 1989 NRC [12].

Table 2. Colostral calcium, copper and zinc concentration of mare

	Concentration (liquid basis)		
	Calcium (mg/dl)	Copper (ppm)	Zinc (ppm)
Farm			
A (n=7)	80.7±13.7	0.76±0.30	7.37±3.31
B (n=2)	84.4± 0.1	0.72±0.29	8.59±4.41
C (n=3)	86.6± 3.5	1.02±0.19	8.10±0.78
Means of all (n=12)	82.8±10.5	0.82±0.28	7.76±2.85
Range	58.7–101.0	0.46–1.33	3.28–11.72

Values are means±SD.

rent from the others. Although dietary zinc content was highest in A farm and lowest in C farm, colostral zinc concentrations were not different between these farms. These results suggested that colostral calcium, copper and zinc concentrations are not affected by dietary contents of these minerals. Baucus *et al.* [2] and Breedveld *et al.* [3] reported that copper or zinc supplementation did not affect mineral composition of mare's colostrum or milk.

The relationship between age of mares and colostral copper or zinc concentrations are shown in Figs. 1 and 2. There were significant ($P<0.05$) negative correlations in both elements, but there was no significant correlation between age of mares and colostral calcium concentration. Kume and Tanabe [11] reported that lactation number was a major factor for alteration of colostral

calcium, phosphorus, magnesium and zinc concentrations of cows. Foley and Otterby [6] reported that composition of colostrum was influenced by function of mammary gland and constituents of blood. It is suggested that copper and zinc intakes by the newborn foals may diminish as age of dams increased in the present study.

Although deficiency of copper and zinc for growing horse is suggested to cause bone malformation such as DOD [1, 4, 10], there is a few information on the relation between composition of milk and bone formation. Hildebran [8] reported that leaking of colostrum before foaling might cause the incidence of epiphysitis because of diminishing the supply of copper to the newborn foal. Further study is needed to clarify the role of minerals of colostrum or milk on bone formation in the foal.

Fig. 1. The relationship between age of mare and colostral copper concentration A, B or C represent colostrum samples collected at each farm.

Fig. 2. The relationship between age of mare and colostral zinc concentration A, B or C represent colostrum samples collected at each farm.

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