NUTRIENT COMPOSITION OF MILK FROM DOMESTICATED TAIGA MOOSE DURING THE LACTATION PERIOD

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ABSTRACT: Changes in the concentrations of mineral and organic substances in moose milk during lactation were examined in relation to lactation stage and nutritional (dry matter) intake by domesticated taiga moose. Initial increases in nutrient and fat concentrations were documented in the milk during the lactation peak in June (lactation days 1–25), concurrent with the availability of high quality forage. Subsequent measures of mineral element concentrations in moose milk gradually decreased (lactation days 26–100).

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It has been previously documented that moose (*Alces alces*) milk has a high nutritional value and is important to the survival of neonates (Franzmann et al. 1976, Gelbert and Kargina 1989, Ivanova et al. 1991). However, little is known about the nutrient content of moose milk during the lactation period. The purpose of this paper is to document the concentrations of mineral and organic substances in the milk of domesticated taiga moose during lactation.

METHODS

We examined the nutrient composition (i.e., mineral and organic substances) of milk produced by lactating, domesticated female moose on a Pechora-Ilych reservation farm. Data were collected over a 2-year period from 8 animals of differing ages (2 – 12 years) and milk productivity (140 – 350 kg total production). During the lactation period moose were fed birch, willow, rowan-tree, and aspen branches, in addition to a maximum of 10 kg of potatoes and 3-3.5 kg of concentrates (mixed feed) per animal per day. Samples were collected during every milking event 7-10 days after the calving and 3 – 4 times during each of the following periods: peak lactation (20 – 25 days post-calving), the decreasing production period (45 – 55 days post-calving), and the completion of lactation (80–100 days post-calving), in proportion to milking yield amounts.

RESULTS AND DISCUSSION

Generally, colostrum appears in the nipples a day or two before calving and the colostrum period finishes a day or two post-calving. During the next period (10–25 days post-calving) female moose achieve their highest milk productivity. These levels coincide with increases in the availability of green forage plants, which have high mineral and organic substance concentrations (potassium - estimated maximum of 25 g/kg of dry matter; calcium - estimated maximum of 11 g/kg of dry matter; magnesium - estimated maximum of 3 g/kg of dry matter; phosphorus - estimated maximum of 2.5 g/kg of dry matter; and, protein - estimated maximum of 25 g/kg of dry matter). It appears that maximum milk productivity and nutritional quality are related to the

timing of calving and the production of nutritious forage in the spring (Table 1). For example, on the Kostroma farm, the highest milk yield was observed during the first days of female moose lactation (Gelbert and Kargina 1989).

The colostrum produced during the first two lactation days is rich in protein, after which time there is a decreasing percentage of fat in the milk. The milk composition of Pechora taiga female moose is characterized by the amount of protein exceeding that of fat until the end of the lactation peak period. Calcium and phosphorus levels are greatest during the peak of lactation, although these levels are only 20% of those found in the colostrum (Table 2). Sodium, potassium, and magnesium concentrations in domesticated taiga moose milk remains relatively unchanged over the entire lactation period. The maximum amino-nitrogen level (free amino acids) in the milk occurs during the peak of lactation, however concentrations of nitrogen and protein are low during this period. Therefore, we suggest that because the milk composition of June-calving females has the greatest nutrient concentrations on days 8 through 11 of lactation (20th through the 25th days for May-calving females), lactation levels may be dependent upon forage availability and quality.

Calcium and amino-nitrogen levels in the moose milk decreased 45 – 55 days post-calving by approximately 27 and 40%, respectively. However, dry matter, protein, and nitrogen levels increased by 15 – 16%. In general, the nutritional elements of the milk decreased by an average of 1.5 from the peak of lactation. The completion of lactation (80 – 100 days post-calving) is characterized by an increase in levels of most of the mineral elements by approximately 10–20% over the previous period. In total, domesticated female taiga moose produced an average of 320-350 kg of milk

Table 1. Nutrient concentration (g/kg dry matter) of domesticated taiga moose milk.

Lactation Day	Dry Matter	Total Nitrogen	Amino-Nitrogen	Protein	Sodium	Potassium	Calcium	Magnesium	Chloride	Phosphate
1	200.0	13.7	0.2	87.3	0.3	1.6	2.9	0.2	0.8	2.1
2	180.0	12.6	0.2	80.2	0.3	1.6	3.0	0.2	0.9	2.2
3	178.0	13.2	0.2	84.4	0.3	1.6	3.3	0.2	0.9	2.3
4-5	160.0	12.7	0.2	80.1	0.3	1.5	3.4	0.2	0.9	2.3
6-12	157.0	12.5	0.4	79.6	0.3	1.5	3.6	0.2	1.0	2.3
15-25	152.0	11.3	0.4	72.3	0.3	1.5	3.7	0.2	0.9	2.4
45-55	218.0	11.6	0.2	74.2	0.4	1.4	2.7	0.3	0.8	2.8
80-100	254.0	13.5	0.1	86.0	0.4	1.6	3.4	0.2	0.7	2.7

Table 2. Nutrient content (g/day) of domesticated taiga moose milk.

Lactation Day	Total Nitrogen	Amino-Nitrogen	Protein	Sodium	Potassium	Calcium	Magnesium	Chloride	Phosphate
1	20.94	0.03	133.60	0.49	2.32	4.48	0.32	1.25	3.27
2	35.07	0.06	223.80	0.87	4.39	8.77	0.52	2.58	6.25
3	43.55	0.07	277.70	1.20	5.76	12.04	0.70	3.59	8.53
4-5	42.00	0.07	271.54	1.00	4.98	11.14	0.66	3.01	7.68
6-12	42.30	0.14	269.80	1.03	4.94	12.26	0.70	3.21	7.99
15-25	54.66	0.19	348.50	1.38	7.00	17.68	1.09	4.43	11.76
45-55	39.93	0.07	254.50	1.24	4.69	9.52	1.00	2.60	9.37
80-100	39.83	0.03	253.70	0.43	1.98	3.89	0.21	0.86	3.18

(Kudryavtzeva 1976, Sivoha 1991) and up to 200 g of sodium, 700 g of potassium, 1,300 g of calcium, 110 g of magnesium, 300 g of chlorine, 1,000 g of phosphorus, and 2,500 g of nitrogen.

Therefore, it appears that the milk of domesticated taiga moose possesses its highest nutritional value during the peak of lactation, although protein levels are high through to the completion of lactation. In contrast with the nutritional content of milk from other domesticated ruminants, which do not exhibit sharp changes in the nutrient levels, the nutritional quality of milk from wild and domesticated female moose appears to be dependent upon the lactation period and the quantity and quality of available forage.

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