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The Composition of Moose Milk Following Late Parturition

SKŁAD MLEKA ŁOSIA PO PÓŹNYCH WYCIELENIACH

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Renecker L. A., 1987: The composition of moose milk following late parturition. Acta theriol., 32, 10: 129—133 [With 1 Table].

Two hand-reared moose cows conceived and gave birth to calves in captivity. Parturition in one cow occurred during mid-August with the calf dying as a result of dystocia. Both cows were hand-milked for the first week of lactation to determine yield and % lactose, protein, fat and total solids content in the milk. Although milk yields were low from these moose, milk was extremely concentrated with respect to protein and fat content, while milk lactose remained low in comparison to that of a Holstein cow. Production of concentrated milk may be beneficial for the survival of cervids such as moose which inhabit ephemeral environments with a short growing season.

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1. INTRODUCTION

Like other northern wild *Cervidae*, reproduction in moose (*Alces alces*) is strongly seasonal. Rut generally occurs between late September and mid October (Murie, 1934; Lent, 1973) synchronizing the time of parturition for mid May to early June (Murie, 1934; Hauge & Keith, 1981) with the pulse of new vegetative growth. Although moose are seasonally polyestrus, the peak of the breeding period falls within one estrus cycle. Few cases of late breeding have been documented for moose.

With parturition, the moose cow must produce milk to nourish new offspring. Knorre (1961) determined the chemical composition of milk from hand-reared moose in the Soviet Union. Several authors in North America have reported the composition of moose milk collected from cows either trapped and immobilized (Franzmann *et al.*, 1975) or sacrificed (Cook *et al.*, 1970). However, there are no studies in North America which determined the chemical composition of moose milk obtained from animals milked regularly by hand during the first wek of lactation.

In this paper I document the occurrence of a late parturition in habituated moose and report on the chemical composition of moose milk obtained from hand milkings during the first week of lactation.

2. METHODS

Two hand-reared moose cows were maintained in a 2 ha pasture on a pelleted aspen-concentrate ration (Schwartz *et al.*, 1985) and supplemented with hand-cut browse at the Ministik Wildlife Research Station, approximately 48 km southeast of Edmonton, Alberta, Canada. The moose were 5 years old at the time of conception and were firmly habituated to human presence.

The two moose cows were milked by hand for 5 days subsequent to parturition with samples taken for analysis on selected days. Animals were milked either in the pasture or a staunchion. Initially, a 1.5 ml dose of oxytoccin (Dominion Veterinary Laboratories, Winnipeg, Manitoba R2W 3R4) was administered intramuscularly to initiate the release of milk from one cow, whereas bunting and massaging the udder of the other cow stimulated milk release.

Samples of milk were placed in a 50 ml sample bottle containing an iodine tablet to preserve samples. Milk was analyzed for percent protein, fat, lactose and total solids by the Alberta Milk Testing Laboratory, Edmonton, Alberta, Canada. Milk samples were also collected from a Holstein cow following parturition as a comparative standard. Energy content of milk samples were calculated using a formula which was determined by Perrin (1958).

3. RESULTS AND DISCUSSION

3.1. Reproduction

A hand-reared moose cow gave birth on August 21, 1983. The calf weighed 17 kg and was dead at birth as a result of dystocia. The gestation period for moose is approximately 240—260 days (Peterson, 1955) which would imply that conception in this cow would have occurred between December 18 and 24, 1982. Other cases of late breeding have been documented for moose on December 15 (Moisan, 1955) and mid-December (Coady, 1974) and for wapiti (*Cervus elaphus nelsoni*) during mid-January (Wishart, 1981).

Female moose commonly breed as yearlings (*i.e.* 16—18 months of age) and maintain high reproductive rates until they are at least 12 years old. Duration of estrus during the rut is less than 24 hr, however, the cow may be receptive for 7—12 days (Knorre, 1961). Although the peak breeding season falls within one estrus period, wild *Cervidae* such as the moose, may have up to six periods of heat as indicated by Wishart (1981) for wapiti. The duration of each estrus cycle in moose has been estimated between 18—26 days (Stewart *et al.*, 1985). Extension of the breeding season in wild ungulates into December and January may relate

to plane of nutrition and body weight as reproductive success has been shown to be considerably higher in yearling wapiti receiving high quality diets (Flook, 1970).

3.2. Milk Composition

The samples of moose milk were thick, pale yellow to beige in color and very concentrated when compared to that of a Holstein cow (Table 1). During the first week of lactation, concentration of protein, fat and total solids was high in milk from moose and similar to reports by Knorre (1961), Cook *et al.* (1970) and Franzmann *et al.* (1975). Robbins *et al.*

Table 1

The composition of milk from two moose and one Holstein cow.

Days after parturition	Fat (%)	Protein (%)	Lactose (%)	Total solids (%)	Energy MJ/kg
		Moose cow 1			
4	4.7	17.5	2.6	31.0	6.3
5	6.0	18.8	2.6	31.2	7.1
		Moose cow 2			
2	4.0	9.2	2.5	24.5	4.1
3	7.5	9.5	2.0	27.4	5.4
5	11.7	12.0	1.3	32.4	7.4
		Holstein cow			
5	2.5	3.1	4.3	11.3	2.4
	Holstein — Alberta Provincial Average				
	3.6	3.2	5.0		3.0 [1]

[1] Kim Whitehead, pers. commun. Alberta Milk Testing Laboratory, Government of Alberta, Edmonton.

(1981) suggested that the higher protein content of milk from wild *Cervidae* may reflect greater tissue demands for this nutrient. This is shown by a higher body protein content than that of domestic ruminants (Gardner *et al.* 1964, Robbins 1973). Unlike the pattern commonly observed in members of the family *Bovidae* (Jenness & Sloan, 1970), moose milk has relatively low lactose content similar to concentrations observed for barren-ground caribou (*Rangifer tarandus groenlandicus)* (Hatcher *et al.*, 1967), however, the energy content of this milk is relatively high and similar to that of red deer (*Cervus elaphus*) (Arman *et al.*, 1974) and wapiti (Kozak, 1986). Although the sample size is limited, the results suggest that the characteristics of moose milk may reflect a survival mechanism. Like caribou, moose inhabit environments in which the summer growth pulse of forage are very brief and food resources are of high quality and clumped. White and Luick (1984) have

suggested that low levels of lactose production may actually reflect the status of body tissue stores of the cows and the primary need for weight gains. A strong feedback mechanism to replenish body condition during the short growing season, before the onset of the autumn rut, may indeed pre-empt high lactose production.

Moose cows produce about 150 kg of milk per lactation in the wild, but domesticated individuals have produced up to 430 kg (Yazan & Knorre, 1964). Nevertheless, this is considerably less than milk yields/lactation of domestic cattle breeds which produce over 1700 kg (Arman, 1979).

The yield of milk from the moose varied between 1920 and 2160 ml/d (320 and 360 ml/4 hr milking). This value is similar to milk production of hand-milked wapiti hinds during the early stages of lactation (values range between 1495 and 2900 ml/d) which received either no feed supplement or a pelleted concentrate ration (Kozak, 1986). When combined with the milk composition data, an understanding of maternal investment and anti-predator strategy is revealed. Although there is a need to maximize body condition of the dam to ensure high conception rates, the moose must also provide adequate milk energy to successfully rear her offspring. White and Luick (1984) hypothesized that while a need to replenish body stores may be responsible for the low content of lactose in milk, low lactose production may in turn be the mechanism which controls low milk production. Clearly, the benefit to the dam would be conservation of energy which could be redirected towards weight gain. Because moose generally live in closed forest habitats, their young depend on cryptic colour and secretive behavior to avoid predators. Arman (1979) alternatively suggested that the purpose of concentrated milk in wild ungulates that hide their calves may be to reduce suckling time and thereby minimize the threat of predation. Thus, two schools of thought can be applied to the adaptive significance of concentrated milk. Its role may be associated with either maximizing maternal body condition before the autumn breeding season or predator avoidance as observed in moose calves.

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