
SHORT REPORT

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CHANGES IN WATER BALANCE AND BLOOD VOLUME RELATED TO SUDDEN CESSATION OF MILKING IN GOATS

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Abstract

After the cessation of milking in lactating goats, water consumption decreased markedly. This change coincided with a decrease in water loss in feces and urine. Apparent water balance remained positive as in control. No significant changes in plasma volume, osmolality and packed cell volume were apparent for four days after cessation of milking.

The process of lactogenesis has been extensively studied in both lactating goats and cows. Very little data are available on the reverse process at the end of lactation. Recent work has shown that the arrest of milk secretion following cessation of milking in goats are largely under local control¹. It remains uncertain whether other systematic parameters like water balance or blood volume will be affected with the cessation of milking, and whether any alteration could be identified which might themselves be factors responsible for the arrest of milk secretion. Lactating goats were used in this study to investigate these possible effects on water balance and blood volume.

Four British Saanen non-pregnant lactating goats aged from 3-6 years, weighed 50-60 kg. were studied. All goats has completed at least one previous lactation and experiments were carried out 28 to 32 weeks *post partum* (i.e. late lactation). Animals were housed in a room with ambient temperature at 20°C. On the day before the experiments, two catheters were inserted into both jugular veins for measurements of plasma volume. Water balance and plasma volume were determined as described previously by Chaiyabutr *et al*². Measurements were made over a period of four days

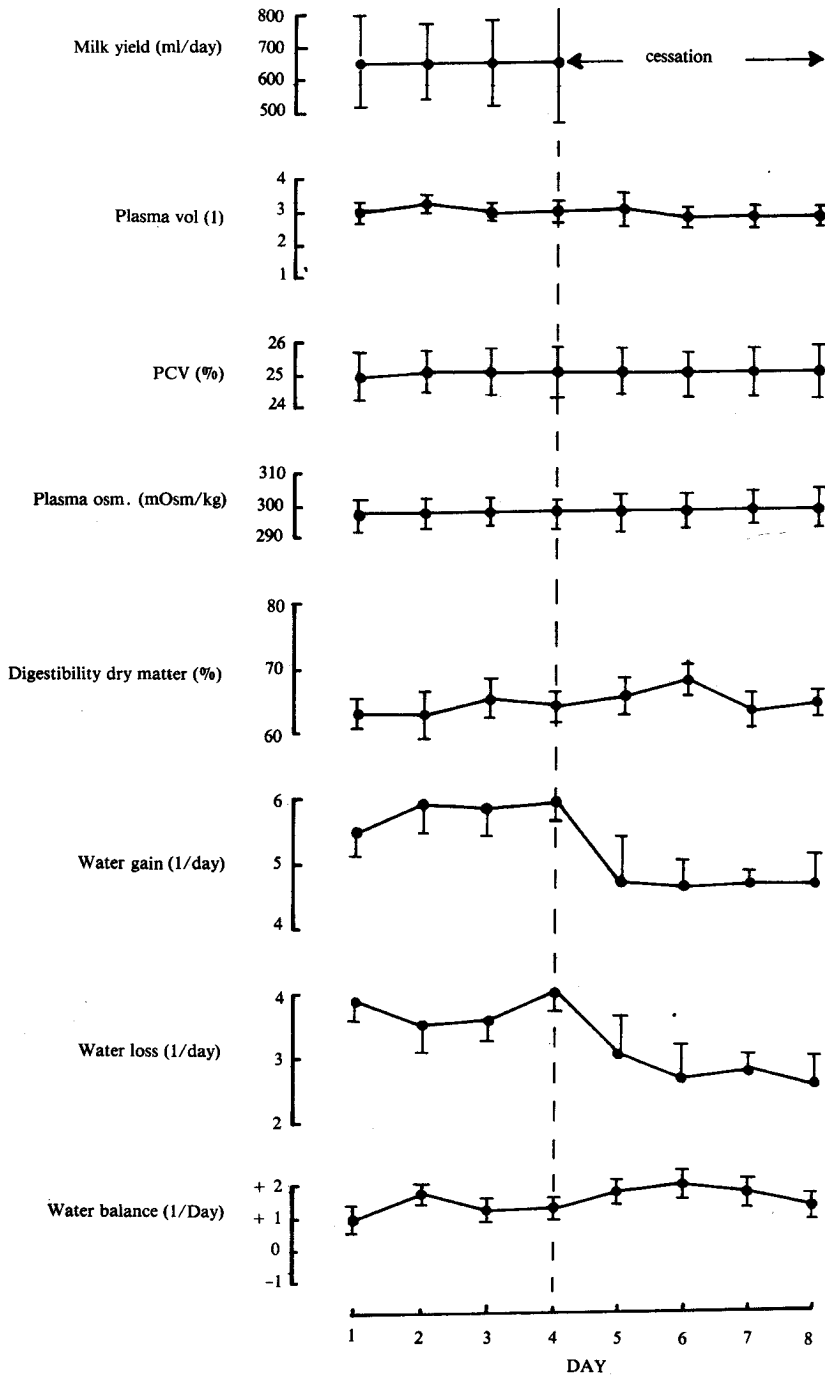


Fig. 1 Changes in water balance, plasma volume, digestibility of dry matter after the cessation of milking. Points are the mean values with their standard errors represented by vertical bars for four animals. * P < 0.05

TABLE 1. CHANGES IN PLASMA VOLUME, DIGESTIBILITY OF DRY MATTER AND WATER BALANCE AFTER CESSATION OF MILKING.

	After cessation of milking				
	Control	24 h	48 h	72 h	96 h
Plasma volume (l)	3.13 ± 0.22	3.04 ± 0.33	2.98 ± 0.21	2.97 ± 0.15	2.86 ± 0.12
Plasma osmolality (m Osm/kg H ₂ O)	298 ± 4.1	298 ± 3.7	298 ± 3.9	297 ± 4.4	298 ± 4.2
Packed cell volume (%)	25 ± 1	25 ± 1	25 ± 1	25 ± 1	25 ± 1
Digestibility of dry matter (%)	64 ± 2	67 ± 2	69 ± 2	63 ± 2	63 ± 1
Water gain (l/day)					4.47 ± 0.41
By drinking					0.28 ± 0.03
In food ^a	5.34 ± 0.23	4.57 ± 0.79	4.47 ± 0.46	4.55 ± 0.10 ^c	4.78 ± 0.43
Total	0.34 ± 0.02	0.31 ± 0.02	0.32 ± 0.02	0.30 ± 0.01	
Water lost (l/day)	5.66 ± 0.16	4.88 ± 0.77	4.79 ± 0.47	4.85 ± 0.08 ^c	
In milk	0.67 ± 0.20	—	—	—	—
In feces	1.35 ± 0.04	1.08 ± 0.08	1.10 ± 0.11	1.21 ± 0.09	1.28 ± 0.11
In urine	2.30 ± 0.31	1.93 ± 0.63	1.57 ± 0.34 ^c	1.65 ± 0.31 ^c	1.90 ± 0.22 ^c
Total ^b	4.23 ± 0.25	3.01 ± 0.65	2.67 ± 0.32 ^c	2.87 ± 0.31 ^c	3.18 ± 0.32 ^c
Apparent (sensible) water balance (l/day)	+1.44 ± 0.17	+1.87 ± 0.23	+2.12 ± 0.13	+1.99 ± 0.11	+1.60 ± 0.13

Mean values ± SE are given (n = 4)

^aFrom water content of food, concentrated diet & hay (i.e. excluding metabolic water)

^bExcluding evaporative loss

^cP-values with respect to control (by paired t-test) < 0.05

before cessation of milking (control) and the following four days.

It was found that after cessation of milking water intake by drinking significantly decreased from a mean of approximately 5.3 l to 4.5 l per day ($P < 0.001$). This coincided with a significant decline of water loss in feces and urine ($P < 0.05$) (Fig. 1, Table 1). The decrease in water intake appeared to be more pronounced in goats with higher milk yield. Because of no loss of water in milk, the apparent water balance was still positive during the four days after cessation of milking. No significant changes in the digestibility of dry matter and packed cell volume were apparent after the cessation of milking. Plasma volume and plasma osmolality remained unchanged.

In the present study lactating goats were kept on a diet of constant compositions and amount. Therefore, a decrease in water consumption could not be expected in view of the well known relationship between food and water intake^{3,4}, but dissociation of this relationship was seen after the cessation of milking. It is known that during lactation water turnover and energy metabolism are normally high and closely related⁴. The availability of water is essential for milk production, since the withdrawal of drinking water of the dairy goat led to a marked reduction in the rate of milk secretion⁵. After the cessation of milking goats drank only to keep their physiological homeostasis. The rapid changes in water intake but unchanged water balance in the present study appear simply to reflect a change back to normality, as part of a process of deadaptation from the lactating state. It is likely that the reduction of water intake could have restored the animal to equilibrium in the face of no water loss in milk of 700 ml per day during the four days after the cessation of milking. During lactation many bodily functions are altered: for example, blood volume and cardiac output are increased^{6,7}. The changes in blood volume, osmolality and other vascular adjustments are delicate and continuous process under the control of hormonal and physical feedback⁸. In the present study changes in blood volume or vascular adjustments might not be expected in the short period of four days after the cessation of milking.

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บทคัดย่อ

การศึกษาผลของการหยุดรีดนมโดยทันทีในแพะนม พบว่าในระยะเวลา 4 วันหลังจากหยุดรีดนม นอกจากจะมีการเปลี่ยนแปลงสรีรวิทยาของเต้านมโดยตรงแล้ว สัตว์จะค้ำน้ำลดลงอย่างมีนัยสำคัญ การสูญเสียน้ำทางปัสสาวะและอุจจาระก็ลดลงอย่างมีนัยสำคัญเช่นกัน แต่ปริมาณอาหารที่กินยังคงที่ ความสมดุลของน้ำภายในร่างกายยังคงที่เป็นไปในทางบวก ผลของการหยุดรีดนมทันทีไม่มีผลต่อปริมาณพลาสติก ปริมาณเม็ดเลือดแดง และค่าพลาสติก ออสโมลาลิตี