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virtually all the cows were observed eating snow.

No constant pattern of drinking water was identified among the cows with access to water. However bouts of snow eating by the cows denied water were evident shortly after sunrise each morning and after the mid-day feeding period. In the present study the cows showed a preference for clean snow which could easily be picked up with a circular scooping motion of the tongue similar to that used in grazing. Areas of trampled, wind-blown or crusty snow tended to be avoided. The duration of snow eating bouts were dependent upon air temperature. On warmer days both groups of cows tended to be dispersed over the field and snow eating by the snow treatment group was prolonged considerably more than during colder days. This observation is similar to that seen in individually fed cows reported in Experiment I in the previous while. On days colder than -20°C the cows tended to spend substantial time standing huddled together in areas sheltered from wind.

The liveweight changes of the 2 groups of 50 beef cows was not significantly different (Table 1). This confirms the earlier report from individually fed cows that the liveweight of pregnant beef cows is not significantly influenced by the denial of liquid water.

Conclusion

The results of the present study confirm that cows and growing calves can obtain their water needs from snow. While cattle will ingest snow if liquid water is denied there is an adjustment period during which learning must occur. However it appears that most cattle will adapt to snow ingestion within 3 to 5 days and show minimal trauma during this period although there may be a temporary weight loss presumably through loss of fluids in the transition period.

Lactation and water turnover in ewes relying on snow as their water source

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As part of the program examining the consequences of relying on snow as a source of water for livestock it was important to know if animals with high water needs could obtain sufficient water from snow. Lactating ewes were chosen for the study.

Materials and methods

Animals and management

Estrus was synchronized in 15 cross-bred Suffolk ewes for lambing to occur in early winter. Synchronization was achieved by vaginal pessaries (Syncro-Mate) which were maintained for 11 days and on the day of removal the ewes received an intramuscular injection of 500 I.U. pregnant mares serum gonadotrophin (PMSG). The ewes were mated to Suffolk rams 2 to 5 days after PMSG injection. Eight of the ewes had at least one ram-lamb and these ewes, each nursing a ram-lamb, were used. The excess lambs were cross-suckled onto other ewes.

Throughout the experimental period, the ewes were kept outdoors in a 3 ha field as a single group and were provided with a wind shelter in an open front shed and straw bedding. For the 4th and 5th months of pregnancy they were group fed once daily 2 kg/ewe of dehydrated alfalfa pellets (DM = 91.6%; protein = 14.2%; acid detergent fiber = 30.8%) and were offered water ad libitum. During lactation, the ewes were fed the same ration while in individual indoor pens and while separated from their lambs. Any feed remains were weighed. All ewes received weighed water once-a-day when feeding till the 4th week (December 20, 1979) of lactation and thereafter 4 of the ewes were denied liquid water and only had access to snow on the ground in the field. From the 10th week of lactation and during the time the ewes were being fed, the lambs were group fed once daily 185 to 250 g/lamb of a prepared mixed creep feed.

Measurements

The ewes and their lambs were weighed, milk yield was estimated and hematocrit was determined every 2 weeks. Milk yield was estimated using intravenous oxytocin injections and 3 h were allowed between milkings. Milk samples were analyzed for fat, protein and lactose. Water and feed intakes of the ewes were measured and averaged over 2 weekly periods. Also bi-weekly water turnover of the ewes was estimated by tritiated water injections and by following the decline in plasma tritium counts.

Results and discussion

The ewes that were denied water readily accepted snow within 24 h as a water source and showed no abnormal or distressed behaviour. Once the treatments were established the ewes on snow would immediately run to eat snow following feeding whereas the ewes receiving water nursed their lambs. On occasions the ewes that had access to water were observed to ingest snow; however, the extent and intensity of ingestion of snow was much less than for the ewes without access to water.

All ewes lost slightly in liveweight during lactation (Table 1) and there was no significant difference between treatment groups. The overall liveweight gain of the lambs from both groups of ewes was similar averaging 118 g/day for the water group and 105 g/day for the snow group.

The snow ewes consumed somewhat less feed from the 6th to 10th week of lactation (by 0.26 to 0.31 kg/day see Table 2) but their feed intakes were similar thereafter. The total water turnover was higher for the watered ewes by 1.03 to 1.51 l/day (Table 2) with the smaller differences occurring

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Table 1. Liveweight, milk yield and hematocrit of the 8 ewes receiving either *water* or *snow* from the 2nd to 14th weeks of lactation.

		Week of lactation						
		2[1]	*4*[1]	*6*	*8*	*10*	*12*	*14*
Liveweight	*Water*	50.6	49.3	46.7	48.8	47.1	46.6	48.8
(kg)	*Snow*	51.3	50.2	48.1	48.5	46.8	46.9	49.1
Milk yield	*Water*	1.35	1.49	1.35	0.93	0.83	0.67	0.59
(kg/day)	*Snow*	1.33	1.47	1.33	0.86	0.79	0.69	0.64
Hematocrit	*Water*	34.5	34.5	30.7	29.7	29.1	30.4	30.7
(%)	*Snow*	36.8	34.1	30.7	30.4	30.9	32.0	33.0

1. Both treatment group received liquid water.

Table 2. Water intake, feed intake and water turnover of the 8 ewes receiving either *water* or *snow* from the 2nd to 14 weeks of lactation.

		Week of lactation					
		2-4[1]	*4-6*	*6-8*	*8-10*	*10-12*	*12-14*
Water intake	*Water*	3.10	3.10	3.85	3.69	3.41	3.54
(l/day)	*Snow*	2.97	—	—	—	—	—
Feed intake	*Water*	1.23	1.61	1.81	1.78	1.81	1.95
(kg/day)	*Snow*	1.35	1.55	1.50	1.52	1.79	1.87
Water turnover	*Water*	4.12	4.81	4.85	4.89	5.14	4.96
(l/day)	*Snow*	3.96	3.57	3.34	3.50	4.04	3.93

1. Both treatment groups received liquid water.

at the latter part of the study. Despite this difference in total water turnover, the milk yield was similar for the 2 groups (Table 2) ranging between 0.62 l/day during the 14th week of lactation to 1.48 l/day during the 4th week. As well, the composition of the milk was similar for the 2 treatment groups.

Summary

Lactating ewes nursing a single lamb can quickly adapt to ingesting snow and can apparently obtain a sufficient amount of water from this source when no liquid water is available. Each ewe was able to support herself as well as raise a lamb. Although the total water intake was slightly depressed in the ewes relying on snow, they were able to compensate and there was no effect on milk yield or evidence of body dehydration.