Maternal Facilitation of Sucking Drive in Newborn Lambs

Abstract. *Although active maternal assistance is not essential for the newborn lamb to find the teats and suck for the first time, the process is facilitated by grooming and by directional orientation of the ewe toward the lamb. Neither orientation nor grooming alone facilitated the sucking drive to any significant extent.*

Maternal care, such as nest building, the provision of body warmth, and retrieving, is obviously important in mammals born helpless and physiologically immature; but in mammals which are well developed and physiologically mature at birth, for example, ruminants, the role of maternal care is not well understood.

Blauvelt (*1*) has suggested that in goats it is important for the mother to maintain a "territory" around her kid and that, by orientating toward the kid, that is, standing facing the kid, the doe aids it to find the udder. Barron (*2*) and others have suggested that maternal grooming (licking of the newborn) may have a survival value in raising the general level of neural excitability and hence, presumably, increasing the chances of the newborn finding the teats and sucking. However, neither of these suggestions was supported by scientific proof. The work described herein was undertaken to provide objective evidence about the importance of maternal orientation and maternal grooming.

The experiments were made on fine-wooled Merino sheep. The ewes were 5 to 7 years old and had been mated annually from 1½ years of age; they were accustomed to the presence of man and to confinement in small yards. Nutrition during pregnancy was adequate; ewes gained an average of 8.5 kg, of which 6 kg were gained during the 5 to 6 weeks immediately prior to lambing.

During early labor, ewes were placed in pens 1.2 m long by 1.2 m wide, in a shed kept at about 21°C. Treatments were allotted in a predetermined random order as ewes were first detected in labor, and were applied immediately after lambing but before maternal grooming could commence. The few ewes in which milk could not be removed easily from the udder by hand were rejected, and ewes producing twins were excluded. All ewes showed immediate interest in their newly born lambs.

A pilot experiment was done in 1962 (Table 1). An untreated control group (group 1) was compared with a group (group 2) in which both orientation and grooming were prevented by fastening the neck of the ewe to a fixed wooden frame and confining the lamb to the area behind the head of the ewe. Lambs in both groups were weighed hourly in a sling suspended from a spring balance. This necessitated removal of the lamb from the ewe for several minutes. There was no other interference.

In 1963, the experiment was repeated (groups 1 and 2) and an attempt was made to separate the effects of grooming from those of orientation by introducing three additional groups (Table 1). Group 3 was similar to group 2, but the lamb was artificially groomed by rubbing the body vigorously with a wet hand for 2 to 3 minutes at approximately 5, 20, 35, and 50 minutes after birth. The operator's hand was wetted to avoid reducing the amount of birth fluid to be evaporated, which would have provided these lambs with an advantage over those not groomed. In group 4 grooming was prevented by fastening a mask to the head of the ewe, leaving her free to orient toward the lamb; and in group 5 the ewe was also masked but the lambs were artificially groomed as in group 3. Comparison between groups 2 and 3 and between groups 4 and 5 were expected to show the effects of grooming in the respective absence or presence of orientation; comparisons between groups 2 and 4 and between groups 3 and 5 were expected to show the effects of orientation in the respective absence or presence of grooming. Lambs which were not groomed received minimal interference. All lambs were weighed hourly as before, and the rectal temperature of groomed lambs was recorded several times during the first 1½ hours of life to eliminate the unlikely possibility that the lambs might become hypothermic during drying of the coat (*3*).

In both years the ewes were released from the frames, and the masks were removed 12 hours after birth.

Table 1. Effect of maternal orientation and grooming on "sucking drive" in lambs.

Group No. and treatment of ewe	Treatment of lamb	Time taken for lambs to gain in weight after birth: Mean time interval (hr)*	Time taken for lambs to gain in weight after birth: Proportion not gaining in weight	Teat-seeking activity of lambs during first hour after birth: Mean No. of observations of activity	Teat-seeking activity of lambs during first hour after birth: Proportion of lambs showing activity
Experiments conducted during 1962					
(1) Control	Control	2.81	0/10	1.00	6/10
		$p = .054$†		$p = .050$	
(2) Held by neck (no orientation)	Not groomed	4.06	3/10	0.40	4/10
Experiments conducted during 1963					
(1) Control	Control	1.78	0/10	0.70	5/10
		$p = .122$		$p = .159$	
(2) Held by neck (no orientation)	Not groomed	3.12	0/9	0.33	3/9
(3) Held by neck (no orientation)	Artificially groomed	4.01	1/9	0.56	3/9
		$p < .05$		$p = .10$	
(4) Head in mask (orientation permitted)	Not groomed	2.94	1/10	0.40	4/10
		$p \doteq .07$	$p < .05$		
(5) Head in mask (orientation permitted)	Artificially groomed	1.70	1/9	1.22	6/9

* Each mean is the antilogarithm of the mean of the individual values expressed as logarithms to the base 10; logarithms were used to normalize the distribution. † Includes a component from binomial tests on proportion of lambs not gaining in weight; the probabilities were combined by the method of Weiler (*8*).

The ewes in groups 1, 2, and 3 did not appear to be disturbed by the treatment they or their lambs received; the ewes in groups 4 and 5 were disturbed only for the first few minutes after the mask was applied. All the ewes ruminated normally, and, in most cases, when the lambs sucked, they took up the attitude characteristic of suckling—that is, they depressed their hind quarters.

The effects of the treatments on the drive to suck were assessed in two ways. The first was based on the time after birth, at which the weight of the lamb began to increase through intake of milk. Owing to movement of the lambs during weighing, errors of 50 g were possible. The most likely time at which the lamb first increased in weight was therefore determined from a plot of the weights; usually it was clear-cut.

The second basis of assessment depended on the observed teat-seeking activity of lambs. To avoid the rigid demands of constant observation, ewes and lambs were each observed for a few seconds, and behavior noted once every ¼ hour (*4*). The number of observations in which lambs in the various groups appeared to be making active attempts to reach the udder or to suck during the first hour after birth were compared; both the proportion of lambs showing teat-seeking activity and the mean activity in each group were examined. No correction was made for the few observations in which the ewe was lying down so that attempts to suck could not be made. These observations appeared to be randomly distributed throughout the groups.

Results are shown in Table 1. In both 1962 and 1963, lambs that were not groomed and whose mothers could not orient toward them (group 2) were generally slower in gaining weight than control lambs (group 1). Neither difference alone was statistically significant (*5*), but the combined probability (*6*) was .04. Likewise, the teat-seeking activity in group 2 was lower in both years than in group 1. The difference in mean activity (*5*) in 1962 was significant; the combined probability (1962, 1963) was less than .05. Differences in the proportion of lambs showing teat-seeking activity were not significant (*7*).

The same general result was obtained by making similar comparisons between the treated groups in 1963; in group 5, in which orientation was permitted and the lamb was artificially groomed, the mean time taken for lambs to increase in weight was significantly less ($p < .05$) than the average of the groups in which either orientation or grooming or both was prevented (groups 2, 3, and 4). The mean teat-seeking activity in group 5 was also greater ($p < .01$) than in these other three groups combined. It is clear, therefore, that maternal assistance does facilitate the progress of the lamb toward successful sucking. The results also provide evidence about the relative importance of maternal orientation and of grooming. In the groups in which lambs were artificially groomed (groups 3 and 5, 1963) maternal orientation resulted in a significantly earlier increase in weight of lambs, and activity tended to be greater than when ewes were held. These trends were not seen in the absence of grooming. In the groups in which orientation was permitted (groups 4 and 5), artificial grooming resulted in a significantly greater "teat-seeking" activity, and there was a tendency toward an earlier increase in weight than in lambs which were not groomed, but these trends were not seen in the absence of orientation (groups 2 and 3).

Thus both orientation and the stimulation of grooming appear to facilitate the drive to suck and, presumably, increase the chances of survival. However, under the present experimental conditions it appears that neither orientation nor grooming alone increases the chances of successful sucking to any significant extent.

These results also show that under the present favorable conditions of close confinement of ewe and lamb and of mild air temperatures, active maternal assistance is not essential for most newborn lambs to find the teats and to suck.

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References and Notes

1. H. Blauvelt, *Proceedings of the 1st* (1954) *and 2nd* (1955) *Conferences on Group Processes* (Josiah Macy, Jr. Foundation, New York) (1954), p. 221; (1955), p. 94.
2. D. H. Barron, *Proceedings of the 1st Conference on Group Processes* (Josiah Macy, Jr. Foundation, New York, 1954), p. 225.
3. G. Alexander, *Aust. J. Agric. Res.* **13**, 100 (1962).
4. This procedure is not intended as a substitute for continuous observation, which is essential to the understanding of the behavior of newborn lambs during their initial search for the teats.
5. "*t*" Tests were used for the calculation of significance of differences in the time taken for lambs to gain in weight and in the number of observations of activity. Tests were "one-tailed," since differences were in the expected direction.
6. R. A. Fisher, *Statistical Methods for Research Workers* (Oliver and Boyd, London, ed. 11, 1950), p. 99.
7. The significance of differences in the proportion of lambs showing activity was calculated by the χ^2 test for 2 × 2 contingency tables.
8. H. Weiler, *Technometrics* **6**, 273 (1964).

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Hue-Wavelength Relation Measured by Color-Naming Method for Three Retinal Locations

Abstract. *A method of hue measurement, in which an absolute color-naming procedure is utilized, has been applied to spectral stimuli delivered as flashes at 0 degrees, 20 degrees, and 40 degrees eccentricity in an otherwise dark field. The method yields very reliable measures, especially at 0 degrees. Color-naming at 0 degrees differs little from that at 20 degrees, but a marked deterioration of performance occurs between 20 and 40 degrees. This is reflected by a reduction in red and especially green responses, and a lower reliability of the measurements. Additional estimates were also obtained which showed a decrease in measured saturation but increasing reliability of the saturation measurements with increasing eccentricity.*

The relation between the wavelength of spectral radiant energy and perceived hue is so well known that it is commonplace to talk about light as if it were colored. This is of course misleading, since color is in the eye (and brain) of the beholder. For example, lights from the long-wavelength end of the spectrum, normally appearing red, become white near absolute threshold, appear black to certain color-defective observers, yellow if viewed peripherally, or even green under certain complex viewing conditions. Indeed, the hue of spectral radiation, as a function of wavelength, is known to depend upon at least a dozen parameters, excellently summarized by Burnham *et al.* (*1*).