

A QUANTITATIVE ETHOGRAM OF BEHAVIOR OF YEARLING EWES DURING TWO HOURS POST-PARTURITION

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ABSTRACT

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A total of 2130 behaviors representing 24 behavioral categories were observed during the period from parturition to lamb nursing for seven ewe–lamb pairs. Both individual behaviors and behavioral sequences were counted. Ewes showed a high frequency of licking, especially directed at the head (41% of licks) and anterior body (30% of licks) of their lambs. Licking followed a specific, non-random pattern. Ewes licked from front to back of their lambs. Ewes licked their lamb's anterior body and head immediately before their lambs stood. When the lambs sought teats, ewes either presented their udder to their lamb which facilitated nursing, or moved away from the lamb which delayed nursing. This research identified behaviors and behavioral sequences that may be used in future studies seeking to select for improved maternal ability or to design improved lambing environments. Finally, this work may lead to the generation of hypotheses which may be tested in future work examining behaviors involved as causal factors in lamb survival.

INTRODUCTION

Failure of lambs to survive to weaning is a major problem under range conditions. In the United States, pre-weaning death losses constitute 20–25% of the lambs born (Safford and Hoversland, 1960) and 70% of this loss occurs during the first 5 days post-partum. In Australia, the highest mortality rates also occur within the first few days after birth (Alexander et al., 1959; Alexander and Peterson, 1961; Alexander, 1964; Dennis, 1965). Failure to establish maternal–neonate bonds is a major factor involved. For example, in a study in south-western Wyoming conducted over a 3-year period (Faulkner and Tigner, 1977), 54% of the lambs were lost due to failure of the ewe to accept the lamb or a failure to produce enough milk to allow for lamb survival.

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A better understanding of maternal–young interactions is necessary for more efficient selection of behaviors to improve maternal bonding. Also, a better understanding of these processes may lead to improved management practices during this critical bonding period.

The objective of this study was to identify behaviors and sequences of behavior shown by yearling ewes and their lambs during the period from birth to the first successful suckling.

METHODS

Behavioral data were collected on seven primiparous yearling ewes at the United States Department of Agriculture's Sheep Experiment Station at Dubois, Idaho. Ewes were crossbred, predominantly from Finnish Landrace and Rambouillet crossbred parents. The air temperature during the observations ranged from 9 to 20°C, and days were sunny with light winds. Ewes were observed on 7 May 1984, between 10.15 and 19.15 h. Two lambing pens contained 150 expectant ewes each.

Behavior was recorded on videotape. Each video-camera was equipped with a zoom lens so that the cameramen could remain outside of the ewe's flight distance of less than 10 m. The ewes were acclimated to humans, since shepherds remained near them during most of each 24-h day.

Video-cameras and recorders filmed ewe and lamb behavior from when each ewe stood after parturition until the lambs suckled for the first time. Computer programs used to identify and count sequences of behavior were previously described (McGlone et al., 1985). The analysis of behavioral sequences followed standard procedure as described by Slater (1973). This analysis identified if behavioral sequences were found at a frequency that was greater or less than that expected by chance.

Behavioral categories used in the final analysis and their definitions are given in Table I. Behavioral categories were mutually exclusive and a behavior could not follow itself (e.g. ELKHD, ELKHD could not occur in sequence). Although the final analysis utilized 24 behavioral categories, initial data identified the possibility of 33 behavioral categories. Behavioral categories not found at greater than 0.1 of 1% were eliminated; these categories included: ewe pushes back half of lamb's body; ewe stands up; ewe lies down; ewe visually orients toward her lamb; lamb touches ewe while both are lying; other ewe butts lamb; other lamb touches ewe; other ewe steps away from lamb to stop lamb investigation; lamb nurses other ewe. All of these eliminated behaviors could occur, but they were not observed except at very low frequencies during the time from parturition to the first nursing bout. Ewe investigation of placenta and uterine fluids could not be identified on the video records because membranes and fluid color blended with ground colors.

TABLE I

Description of behavioral categories and mean frequencies observed from seven ewes

Behavior code	Mean	Minimum	Maximum	Description
ELKHD	50.9	12	93	Ewe licks head (licks include nose-touches)
ELKFR	37.9	2	78	Ewe licks front legs or shoulder
ELKBK	18.7	3	43	Ewe licks hind legs or posterior back (not rump)
ELKRP	5.1	0	13	Ewe licks rump
ELKUN	13.0	0	40	Ewe licks underside
EPUFR	3.4	0	10	Ewe pushes or moves toward front half of lamb's body and lamb moves
LSTANDS	26.9	16	53	Lamb stands up
LDOWN	25.6	15	50	Lamb lies or falls down
LTOEST	33.6	13	101	Lamb touches ewe while both stand (possible teat-searching)
EAWAY	17.9	0	63	Ewe stands away as lamb touched (probably teat-searching)
ESTEP	21.3	4	78	Ewe turns away or steps away from lamb
ELAPART	2	0	6	Ewe and lamb move apart more than two body lengths
LMOAWAY	1.9	0	9	Lambs moves away from ewe
EPAWS	4.3	0	14	Ewe paws at bedding or ground with a front foot
EINGR	9.7	0	36	Ewe investigates ground or bedding
LFOLLOWS	2.7	0	11	Lambs follow ewe
EEATS	3.1	0	22	Ewe eats food
EPRUD	2.3	0	7	Ewe presents udder to lamb
OETOL	8.0	0	21	Other ewe touches lamb (interference)
LINOE	3.4	0	11	Lamb investigates other ewe
EBLIN	2.1	0	6	Ewe blocks interference (by other ewe) by stepping between lamb and other ewe or by butting
ETOO	1.1	0	7	Ewe touches other lamb
LNURSES	1.0	1	1	Lamb nurses (lamb in correct area, down in front, tail wagging)
HUINORBL	8.4	1	18	Human interference or animal blocked view
Grand mean	304.3			

RESULTS

A total of 2130 behaviors belonging to 24 behavioral categories were present in the repertoire of the seven ewes observed interacting with their lambs (Table I). On average, the ewes and lambs showed 304 behaviors prior to suckling. All lambs reported here suckled within 2 h of parturition.

The most common behaviors shown by the ewes were licking their lambs. Most licking by the ewe was directed toward the lamb's head (frequency = 356, 41% of licks) followed by licking the anterior body (frequency = 265, 30%). Licks to the lamb's back (frequency = 131, 15% of licks), underside (frequency = 91, 10% of licks) and rump (frequency = 36, 4% of licks) were less common.

TABLE II

Behavioral sequences and observed frequencies from seven ewes

First Behavior	Second behavior											
	ELKHD	ELKUN	ELKFR	ELKBK	ELKRP	EPUFR	EINGR	EPAWS	EPRUD	EEATS	LTOEST	LMOAWAY
ELKHD	—	7*	87*	4*	1*	6	17	6	1	4	32	2
ELKUN	4*	—	8	6	1	4*	0	4*	0	0	39*	3*
ELKFR	77*	7	—	42*	2	2	12	2	0	5	22	3
ELKBK	11*	4	29*	—	8*	1	9*	1	2	2	15	2
ELKRP	1*	8*	0*	6*	—	0	2	0	0	0	8*	3*
EPUFR	6	0	6	1	0	—	0	2*	0	0	2	0
EINGR	24*	0	15*	4	0	0	—	0	1	7*	0	0
EPAWS	7	3	4	3	0	3*	1	—	0	0	5	0
EPRUD	0	1	1	1	0	0	0	0	—	0	6*	0
EEATS	3	0	4	5*	0	0	0	0	0	—	0	0
LTOEST	14*	27*	12*	19	5	1	4	2	8*	0	—	0
LMOAWAY	3	0	0	1	4*	0	0	0	0	0	3	—
OETOL	13	4	7	2	2	0	0	0	0	0	3	0
ELAPART	3	0	2	0	0	0	1	0	0	0	0	0
LSTANDS	20*	3	6*	2*	3	1	1*	1	1	0	26	0
LDOWN	62*	0*	35*	8	2	1	5	0	2	3	2*	0
LNURSES	0	0	0	0	0	0	0	0	0	0	0	0
ETool	3	0	1	0	0	0	0	0	0	0	0	0
HUINORBL	14	4	6	6	0	0	0	1	0	0	12*	0
EAWAY	15	15*	11	6	4	3	1	4	0	0	51*	0
LINOE	1	3 ⁺	3	3	4*	0	0	0	0	0	1	0
EBLIN	6*	3*	1	1	0	0	0	0	0	0	1	0
ESTEP	62*	2 ⁺	24	10	0	1	15*	7*	1	1	3*	0
LFOLLOW	6	1	1	0	0	0	0	0	0	0	4	0
START	1	0	2	0	0	1*	0	0	0	0	0	0

*Large χ^2 value ($P < 0.05$; 1 df).

⁺Marginal χ^2 value ($P < 0.10$, 1 df).

After licking, ewes showed a high frequency of moving away as the lamb approached (EAWAY and ESTEP, Table I). Ewes showed low incidence of pawing and investigating the ground (EPAWS and EINGR), eating (EEATS), blocking interference by other ewes (EBLIN) and touching other lambs (ETOO).L).

The most frequent behaviors observed for lambs were attempts to stand up (LSTAND) and touching the ewe (LTOEST) in search of a teat. Also, lambs frequently fell down (LDOWN). Behaviors shown by lambs in low frequency were lamb moving away from the ewe (LMOAWAY), lamb follows the ewe (LFOLLOW) and lamb investigates another ewe (LINOE). Of course, the seven lambs only nursed a total of seven times since this was the criterion used to end the observations.

OETOL	ELAPART	LSTANDS	LDOWN	LNURSES	ETOO	HUINORBL	EAWAY	LINOE	EBLIN	ETSEP	LFOLLOW	ENDOBS
9	1	68*	16*	0	1	5	2	2	3	76*	6	0
6*	0	0	4	0	1	4	2	5*	0	0*	0	0
9	1	33*	5*	1	1	8	4*	3	1	25	0	0
5	0	7	3*	0	3*	7	4	2	1	14	1	0
2	0	2	0	0	0	2	0	2*	0	0	0	0
0	0	1	4	0	0	1	0	0	1*	0	0	0
0	0	5	1*	0	0	0	1	0	0	9+	1	0
0	0	3	0	0	0	0	0	0	0	1	—	0
0	0	1	1	2*	0	0	2	0	0	0	1*	0
0	0	5*	1	0	0	1	0	0	0	3	0	0
2	0	0	19	4*	0	3	109*	0	0	4*	2	0
0	0	0	0	0	0	0	0	2*	0	0	0	0
—	0	5	1	0	1	7*	0	3*	6*	2	0	0
0	—	4*	1	0	1*	0	0	0	0	0	2*	0
3	1	—	111*	0	0	2	0	1	0	4*	2	0
7	3	35*	—	0	0	6	0	0	0	7	1	0
0	0	0	0	—	0	0	0	0	0	0	0	7*
2*	0	1	0	0	—	1	0	0	0	0	0	0
4*	0	5	3	0	0	—	0	2	0	2	0	0
1	0	0*	6	0	0	7	—	1	0	0	0	0
4*	0	0	1	0	0	2	0	—	2*	0	0	0
1	0	1	0	0	0	0	0	1*	—	0	0	0
1	5*	9	1	0	0	3	0	0*	1	—	3	0
0	2*	3	1	0	0	0	1	0	0	0	—	0
0	1*	0	0	0	0	0	0	0	0	2*	0	0

Two-behavior sequences are presented in Table II. Ewes displayed a sequence of licking lamb body regions that was specific and apparently non-random. Ewes licked the lamb's head and front part of its body (ELKHD → ELKFR, ELKFR → ELKHD). Ewes also showed a high frequency of licking the lamb's front and back body regions (ELKFR → ELKBK, ELKBK → ELKFR). Also, ewes licked the lamb's back body and its rump in sequence (ELKBK → ELKRP, ELKRP → ELKBK). Other licking patterns were found at a low frequency (ELKHD → ELKUN, ELKUN → ELKHD, ELKHD → ELKRP, ELKRP → ELKHD, ELKHD → ELKBK). In all, ewe licking patterns followed a consistent order. Ewes licked from the head to the rear of the lambs' bodies and then started at the head or shoulders again.

Lambs were born with fluids and membranes covering their bodies. The ewes began licking, and the first activity seen by the lambs was an attempt to stand up. Data in Table II are structured to identify which ewe behaviors immediately precede lamb standing. The sequences ELKHD → LSTANDS and ELKFR → LSTANDS were found at a high frequency. Thus, ewes licking the front part of their lamb may be a stimulus to stand up. Lambs were observed to stand then fall and fall then stand 146 times during the observation period (LSTANDS → LDOWN, LDOWN → LSTANDS).

After the lambs stood up, they began teat-seeking activities. The particular body parts of the ewes that the lamb investigated were not identified. The behavior LTOEST is largely (but not exclusively) teat seeking. After the lamb began LTOEST, the ewe licked the lamb's head, front body parts and underside. Also, several ewes (but not all) presented their udder (i.e. they turned their body to place their udder near the lamb's head) after the lambs began teat-seeking.

After the lambs began LTOEST, there was a high frequency of the ewe stepping away (LTOEST → EAWAY). These behaviors resulted in lambs not being able to locate a teat. However, lambs continued pursuit of a teat, as evidenced by a high frequency of the sequence EAWAY → LTOEST. After the ewes stepped away from lambs (EAWAY), if the lamb did not continue LTOEST, ewes licked the lamb's underside (ELKUN).

Several ewes showed rudiments of apparent aggressive behavior toward their lambs when they pawed the ground (EPAW). EPAW was followed and preceded by the ewe pushing on the front part of the lamb's body. Since EPAW also was preceded by licking (ex ELKUN), this pawing behavior may not represent aggression.

After other ewes interfered with the focal ewe's lamb (OETOL), either the focal ewe blocked this interference (EBLIN) or the lamb investigated the other ewe (LINOE).

Ewes appeared to feed at the feed bunk (EEAT) infrequently. As logic would predict, EEAT was preceded by the ewe investigating the ground (EINGR). EINGR was present in sequence with licking the lamb's head and front region. Video-cameras were not positioned to show whether the placenta or placental fluids were the point of investigation on the ground.

DISCUSSION

We must know which behaviors or sequences of behaviors are exhibited by those ewes that have high mothering ability. Behavioral data from this study indicate that licking the lamb was the primary ewe behavior observed. Bareham (1976) found a similar high frequency of ewe licking, primarily directed towards the lamb's front end prior to the lamb standing. Licking of the lambs immediately after birth may play several important roles. In addition to thermal benefits, our data suggest tactile stimulation of the anterior body encourages the lamb to stand. Future studies may investigate the relationship between vigorous head-shoulder licking by the ewe and lamb viability. Perhaps ewes that lick vigorously cause quicker lamb-standing and nursing. Yearling ewes moved away from their lambs at a high frequency. This may indicate these yearling ewes were unfamiliar and somewhat uneasy with behaviors their lambs exhibited.

Lambs moved away from the ewe (LMOAWAY) after and before the ewe licked the lamb's rump (ELKRP). However, although these sequences occurred, the frequencies were low and probably not biologically important.

After standing, the lambs sought a teat. Teat-seeking was facilitated by those ewes that presented their udder to their lamb. Nursing was prevented or delayed by ewes stepping or moving away from their lamb. This prevention of nursing may have been beneficial, since it gave the lambs time to stand firmly without wobbling. However, ewe-stepping-away certainly delayed nursing. Any delay of nursing would be detrimental in cold weather.

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