

MATERNAL AND NEONATAL BEHAVIOUR IN EGYPTIAN SHEEP AS AFFECTED BY BREED, PARITY AND SEX OF LAMB

A. Y. Abdel-Moneim and M. S. Abd-Alla

Department of Animal Production, Faculty of Agriculture, University of Cairo, Giza, Egypt

SUMMARY

Thirty three Ossimi, Rahmani and Barki ewes and their thirty six lambs were used to study the effect of breed, parity and sex of lamb on maternal and neonatal behaviour during the first hour after birth and at one week after lambing.

Ossimi sheep exhibited higher maternal behaviour during the first hour immediately after birth than other breeds. Ossimi ewes spent the longest time of licking head (8.4 min), the rest of body (9.7 min) and the whole body of lamb (30.7 min) than either Barki ewes (7.8, 7.3 and 29.9 min, respectively) or Rahmani ones (4.2, 5.4 and 21.2 min, respectively). Similarly, the highest frequencies of licking lamb's head (127 times), the rest of body (149.3 times) and the whole body (431.6 times) were significantly ($P < 0.01$) higher for Ossimi ewes followed by Barki ewes (109.6, 131.1 and 413.6 times, respectively) and Rahmani ones (64.4, 74.8 and 225.1 times, respectively). Furthermore, immediately after birth, the highest number of suckling attempts was achieved by Ossimi lambs (17.8) followed by Barki lambs (16.7) and Rahmani lambs (9.2). Significant ($P < 0.05$) difference in suckling attempts was found between Ossimi lambs and Rahmani lambs. At one week after parturition, Ossimi ewes continued to express higher maternal behaviour than that of either Barki or Rahmani breeds. Parity of ewe and sex of lamb had no pronounced effect on either maternal or neonatal behaviour.

Keywords: Maternal behaviour, neonatal behaviour, Ossimi, Barki, Rahmani, parity, sex of lamb

INTRODUCTION

Lambs survival rate during the first week of life is claimed to be relatively low in Egyptian sheep. It ranges from 70% to 88% according to different studies (Galal *et al.*, 1981; Ahmed *et al.*, 1992 and Hassan, 1993). The reasons for such phenomenon are various including pathogenic causes, physiologic effects and managerial disorders. The role of mother-young attachment in this context is not yet fully understood. The present work was designed to investigate such attachment. Maternal behaviour as well as newly-born lamb behaviour immediately after parturition and when the lamb is one week old were intensively observed and recorded. The influences of breed (Ossimi, Barki and Rahmani), mother experience (primiparous and multiparous) and sex of lamb were also considered.

Three indigenous breeds of sheep, i.e. Barki, Ossimi and Rahmani, were used. Barki (population about 3/4 million head) is the smallest breed (40 kg for female mature weight) and raised under extensive production systems (transhumant or nomadic). Ossimi (population about 3 million head) and Rahmani (population about 1/2 million head) are comparatively larger (45 kg and 55 kg for female mature weight, respectively). Both breeds are raised on the Nile delta under either sedentary or stationary system.

MATERIALS AND METHODS

1. Animals

During two subsequent lambing seasons in 2000 and 2001, 10 Ossimi ewes with 10 lambs, 11 Barki ewes with 11 lambs and 12 Rahmani ewes with 15 lambs kept at the farm of Cairo University, Egypt were used. Twelve of these ewes were primiparous (1.5 years of age, and 42.0 kg weight) and 21 were multiparous (2-4 years of age with an average weight of 45.5 kg). Every ewe and lamb had a clear painted number on both sides of the body.

2. Housing

Two weeks prior to the expected date of parturition, the ewes were housed in separating pen (13.0 x 9.5 m and half shaded). Ewes were inspected every three days to transfer those imminent to deliver to a nearby half shaded 12.9 x 8.2 m pen (waiting pen) which had a concrete floor deeply covered with rice straw. Feeding trough and water supply were available in the separating and waiting pens. A video camera was fixed 1.2 m high in the waiting pen one week before starting experimentation in the test pen. This pen (9.9 x 8.2 m) was shaded, fenced and had concrete floor without any bedding. The test pen was sunny and far from any source of disturbance. At its corner, three adjacent lamb cages, 1.2 x 1.2 m each, made from wire mesh, had 1.25 m high fence and a wire mesh door were established. The observer can easily and without any disturbance watch clearly the parturient mother and her lamb inside the pen. All observations were recorded using a video camera. This video camera was fixed 1.2 m high and 2.5 m away from the delivery cage. Meanwhile, the video camera was equipped with a zoom lens so that the observer could stay outside the test pen (behind the gate of the test pen) some 8.0 m from the delivery cages. In the meantime, a mini T.V. (Greatrode "7" Portable B/W, No.GR T.V. -708, China) was used to allow having a clear picture during recording and for the reproduction (replay) of the images. A chronometer was used to measure time after recording period.

A fluorescent lamp (TL 40 W/54) was used by night to give sufficient illumination in every lambing cage for the camera.

The experimental period extended for one week after lambing during which time ewes and lambs were housed in two 23.3 m x 7.4 m half shaded pens ('guesting' pens). Each pen was deeply bedded with rice straw and supplied with feeding troughs and water.

3. Feeding

Ewes were fed *ad libitum* on Egyptian clover (*Trifolium alexandrinum*) from November to April and from May to September, they were given liberal amounts of

Darawa (*Zea maize* L) or *Sorghum vulgare var. succharatum*, Boeral, as well as Egyptian clover hay. Each ewe was supplemented daily with 800 grams of a concentrate mixture. The concentrate mixture consisted of 30% decorticated cotton seed meal, 30% wheat bran, 30% yellow corn, 5% rice bran, 3% limestone, 1% Sodium chloride and 1% common salt. Immediately after parturition, each mother received a daily allowance of one kilogram of the concentrate mixture plus 200 grams yellow corn. Animals had free access to water all the time whether in separating or in waiting pens.

4. Experimental procedures

Behavioural acts of the mother and young were recorded, whether at lambing or at one week after lambing, either by the observer as suggested by Nowak (1990) and Dwyer *et al.* (1998) or by video tape according to Bungo *et al.* (1998) and Dwyer and Lawrence (1998). So high accuracy and no missing of data were guaranteed.

Postpartum behaviour acts recorded within one hour after lambing and after one week were very similar to those suggested by Dwyer *et al.* (2001) and Abdel-Moneim *et al.* (2005).

4.1. Within one hour after lambing

4.1.1. Mother acts

Acts expressed by the mother were: length of labour (the time between protrusion of the lamb head and expulsion of foetus) (min), time of first standing of dam (min), sniffing latency (min), licking latency (min), time of licking head (min), time of licking the rest of body (min), time of licking the rear part (min), total time of licking (min), frequency of licking head (count), frequency of licking the rest of body (count), frequency of licking the rear part (count), total frequency of licking (count), frequency of low-pitched bleats (count), frequency of high-pitched bleats (count), time of nursing bouts (min), number of nursing bouts (count) and number of rejections (count).

4.1.2. Lamb acts

Acts exhibited by lamb were: time of lamb lying (min), latency of successful standing (min), latency to first suckling (min), frequency of sniffing mother (count), frequency of licking mother (count), number of standing attempts (count), number of suckling attempts (count) and number of baings (count).

4.2. At one week after lambing

4.2.1. Mother acts

The following acts were recorded: time of licking head (min), time of licking the rest of body (min), time of licking the rear part (min), total time of licking (min), frequency of licking head (count), frequency of licking the rest of body (count), frequency of licking the rear part (count), total frequency of licking (count), frequency of low-pitched bleats (count), frequency of high-pitched bleats (count), time of nursing bouts (min), number of nursing bouts (count) and number of rejections (count).

4.2.2. Lamb acts

Lamb acts recorded were: frequency of sniffing mother (count), frequency of licking mother (count) and number of baaings (count).

5. Statistical analysis of data

The influence of breed of sheep, parity of dam and sex of lamb on maternal and neonatal parameters during the two experimental periods were evaluated using the GLM procedure for repeated measures analysis of variance (SAS, 1998). Differences among means with each classification were tested using Duncan's New Multiple Range Test. All effects were assumed fixed except the random error, which was assumed normally and independently distributed with mean 0 and variance σ^2 .

RESULTS AND DISCUSSION

1. During the first hour after lambing

1.1 The effect of breed

Results in Table 1 show that time needed to expel foetus after appearance of its head at vulva orifice was longest for Ossimi, intermediate for Rahmani and least for Barki ewes. Difference in this respect was significant ($P < 0.05$) between Ossimi and Barki ewes and non-significant between Rahmani and Barki ones (Table 1). Analysis of variance indicates significant ($P < 0.05$) effect of breed of sheep on time of labour. The previous result showed that time between appearance of head and expulsion of foetus in Barki ewes was shorter than that of Ossimi ewes ($P < 0.05$) and Rahmani ones (Table 1). Barki sheep are desert animals accustomed to walk long daily distances while grazing. Hence, Barki sheep are supposed to be more active at lambing than Rahmani and Ossimi which are usually reared under farm condition. Echeverri *et al.* (1992) reported that, during 12 h before parturition, increased locomotor activities, i.e. walking and standing up, displayed by pre-parturient Suffolk, Hampshire and Dorest ewes, may be related to impending parturition.

In the meantime, both Rahmani and Barki ewes stood up significantly ($P < 0.05$) faster after lambing than Ossimi ewes. Whereas the difference was not significant between Rahmani and Barki ones (Table 1). It seemed that Rahmani ewes were physically more active immediately after lambing. Meanwhile, Rahmani sheep spent significantly ($P < 0.05$) the shortest time in licking head (Table 1). Similarly, frequencies of licking head, the rest of body and the rear part and total frequency of licking were least for Rahmani ewes, intermediate for Barki ewes and highest for Ossimi ones. The effect of breed on frequencies of licking the different parts of body was highly significant ($P < 0.01$) (Table 1). Moreover, highly significant differences ($P < 0.01$) in frequency of low – pitched bleats were observed (Table 1). Ossimi ewes emitted significantly ($P < 0.05$) more low – pitched bleats than Barki or Rahmani ewes (Table 1). It could be deduced that Ossimi breed exhibited comparatively higher maternal behaviour after lambing than the two other breeds.

In the meantime, highly significant differences ($P < 0.01$) in number of rejections were found among breeds (Table 1). Rahmani ewes rejected their lambs attempting to suckle less frequently (162.1 times) than did Ossimi (279.9 times) or Barki ewes (312.7 times).

Concerning the lamb acts it is clear that, with the exception of number of suckling attempts, no significant differences were found among the studied breeds (Table 1). Significant ($P < 0.05$) differences in suckling attempts were observed between breeds with the highest number attempted by Ossimi lambs and the lowest number of suckling attempts achieved by Rahmani lambs (Table 1).

Table 1 The effect of breed of sheep on maternal behaviour displays exhibited during 1hr. immediately after lambing

Factor Displays	Breed									Sig.
	Ossimi			Barki			Rahmani			
	No	\bar{X}	S.E.	No	\bar{X}	S.E.	No	\bar{X}	S.E.	
A. Mother acts:										
1. Time betw. presence of head and expulsion of foetus (min)	10	6.5 a	1.94	11	1.2 b	0.39	15	4.9 ab	1.34	*
2. Time of first standing of dam (min)	4	36.2 a	7.49	4	10.9 b	8.94	9	7.1 b	3.47	*
3. Sniffing latency (min)	10	2.6 a	2.51	11	3.0 a	2.92	15	0.6 a	0.37	
4. Licking latency (min)	10	2.6 a	2.51	11	3.0 a	2.92	15	0.7 a	0.37	
5. Time of licking head (min)	10	8.4 a	0.69	11	7.8 a	1.08	15	4.2 b	0.76	*
6. Time of licking the rest of body (min)	10	9.7 a	0.48	11	7.3 ab	0.96	15	5.4 b	1.14	
7. Time of licking the rear part (min)	10	12.1 a	1.86	11	14.2 a	1.64	15	11.1 a	2.62	
8. Total time of licking (min)	10	30.7 a	1.73	11	29.9 a	2.94	15	21.2 a	4.08	
9. Frequency of licking head	10	127.0 a	14.53	11	109.6 a	12.37	15	64.4 b	6.94	**
10. Frequency of licking the rest of body	10	149.3 a	17.86	11	131.1 a	15.52	15	74.8 b	9.48	**
11. Frequency of licking the rear part	10	155.3 a	24.86	11	172.9 a	18.13	15	85.9 b	13.05	**
12. Total frequency of licking	10	431.6 a	50.32	11	413.6 a	40.07	15	225.1 b	25.71	**
13. Frequency of low-pitched bleats	10	720.3 a	92.01	11	442.6 b	85.32	15	252.8 b	36.60	**
14. Frequency of high-pitched bleats	7	28.6 a	8.63	9	123.1 a	47.70	8	43.6 a	18.31	
15. Time of nursing bouts (min)	9	8.3 a	1.26	11	6.3 a	1.02	15	9.1 a	1.39	
16. No. of nursing bouts	9	29.2 a	4.66	11	24.7 a	3.88	15	19.3 a	3.32	
17. No. of rejections	10	279.9 a	55.53	11	312.7 a	50.18	15	162.1 b	20.22	**
B. Lamb acts:										
1. Time of lamb lying (min)	10	0.8 a	0.32	11	1.1 a	0.22	15	0.8 a	0.22	
2. Latency of successful standing (min)	10	17.5 a	3.78	11	9.6 a	1.79	15	12.6 a	2.50	
3. Latency to first suckling (min)	9	31.7 a	4.88	11	28.4 a	3.63	15	27.2 a	3.74	
4. Frequency of sniffing mother	10	24.7 a	2.50	11	26.3 a	3.41	15	21.5 a	3.05	
5. Frequency of licking mother	10	80.9 a	3.73	11	74.4 a	7.15	15	61.5 a	7.29	
6. No. of standing attempts	10	76.5 a	12.56	11	51.5 a	8.13	15	59.6 a	12.77	
7. No. of suckling attempts	10	17.8 a	4.33	11	16.7 ab	2.41	14	9.2 b	1.58	*
8. No. of basings	10	99.5 a	33.86	10	41.1 a	20.82	15	126.1 a	26.09	

Means in rows not followed by the same letter differ significantly from each other ($P < 0.05$) using Duncan's Multiple Range Test.

Sig.: significance of difference

* $P < 0.05$

** $P < 0.01$

1.2 The effect of parity

Parity affected only four acts in a significant way. These acts are represented in Fig. 1. It is clear that primiparous ewes licked head and rest of body of lamb for significantly ($P < 0.05$) longer time than multiparous ones (Fig. 1 (a, b)). Moreover, the frequency of licking head of lamb was significantly ($P < 0.05$) more for primiparous ewes than for multiparous ones (Fig. 1, c). In the meantime, low-pitched bleats were significantly ($P < 0.05$) more frequent for primiparous ewes (Fig. 1, d). This finding coincided with that of Levy and Poindron (1987) and Dwyer *et al.* (1998). Levy and Poindron (1987) concluded that the total numbers of low-pitched bleats emitted from primiparous ewes were greater (88 bleats) than multiparous ones (40 bleats). Dwyer *et al.* (1998) demonstrated that low-pitched bleating rate (as a care giving act) was significantly ($P < 0.05$) higher (7.0 bleats/10 min) in primiparous ewes than multiparous ones (2.7 bleats/10 min). On the other hand, it was found that multiparous ewes stood up quicker after lambing, sniffed and licked their lambs later than primiparous ewes but the differences due to parity in this study did not reach a significant level. These results are in harmony with that reported by Sharafeldin and Kandeel (1971) who concluded that primiparous Barki ewes spent significantly ($P < 0.01$) longer time to stand up after birth than multiparous ones. Whereas, Poindron *et al.* (1984) indicated that multiparous Ile-de-France ewes spent significantly ($P < 0.05$) longer time to begin licking their newly born lambs than primiparous ewes. In contrast, Levy and Poindron (1987) noticed that in primiparous ewes, the overall latency for the onset of licking the lamb was significantly ($P < 0.01$) higher (4.24 min) than in multiparous ewes (0.01 min).

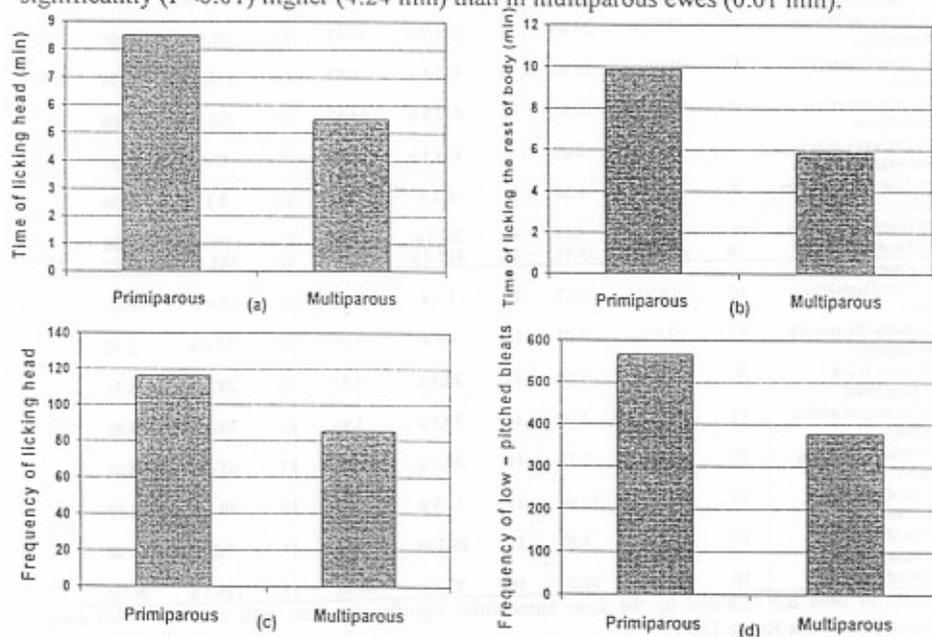


Fig. 1. The effect of parity on: (a) time of licking head, (b) time of licking the rest of body, (c) frequency of licking head and (d) frequency of low-pitched bleats during 1 hour immediately after lambing

1.3 The effect of sex of lamb

Results obtained revealed that sex of lamb significantly ($P < 0.05$) affected only two mother acts (Fig.2). Number of nursing bouts was significantly ($P < 0.05$) more for ewes with males than those with female lambs (Fig. 2, a). Previous reports (O'Connor *et al.*, 1992 and Dwyer and Lawrence, 1998) partially confirmed our results as they found that sex of lamb had no significant effect on time of grooming. Nevertheless, mother- lamb bond seemed to be stronger for male lambs just after birth. This finding is in harmony with that reported by Abdel-Gwad (1987) who observed that during 3 hrs after birth, Rahmani male lambs suckled for longer time than female ones. On the contrary, L'heureux *et al.* (1995) concluded that the mother yearlings attachment appeared stronger for female than for male yearlings in wild Bighorn sheep. In this context, it was found that immediately after birth male lambs were significantly ($P < 0.05$) more rejected by dams than female ones (Fig. 2,b). This result may be attributed to that male lambs suckled more times than female lambs. Presumably, the male lamb might cause more pain to his mother's udder while suckling. Consequently, dams rejected their male lambs more frequently than female ones.

On the other hand, it is interesting that differences due to sex of lamb in any lamb acts studied were statistically non-significant.

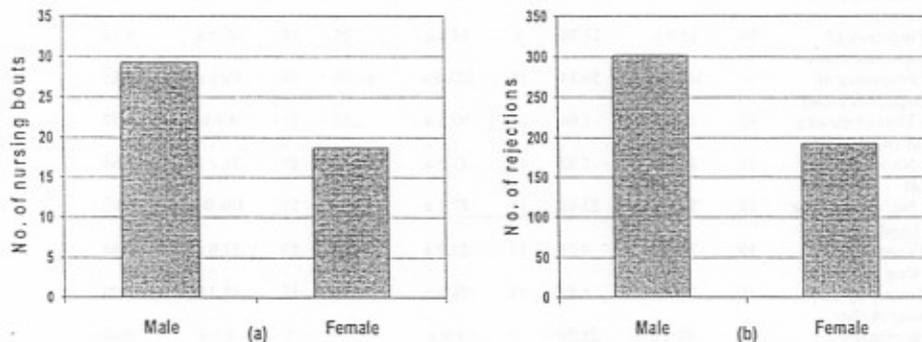


Fig. 2. The effect of sex of lamb on: (a) number of nursing bouts and (b) number of rejections during 1hr immediately after lambing

2. At one week after lambing

2.1. The effect of breed

At one week after lambing, Ossimi ewes licked their lambs for significantly ($P < 0.01$) longer time (7.1 min) than did Barki (3.6 min) or Rahmani (4.8 min) ewes (Table 2). Most of this time was spent in licking the rear part of lamb rather than licking the other parts (head and rest of body) (Table 2). On the other side, licking time, whether for part or the whole body, did not differ significantly between Barki and Rahmani ewes (Table 2). Frequency of licking behaved similarly as Ossimi ewes licked their lambs significantly ($P < 0.05$) more than Barki and Rahmani ewes did. Frequency of licking lamb was similar and did not significantly differ for Barki and Rahmani ewes (Table 2). Meanwhile, time of nursing bouts was significantly ($P < 0.05$) less for Rahmani than either Ossimi or Barki ewes. Difference between Ossimi and Barki ewes in this respect was non-significant (Table 2). It appears that

at one week after parturition, Ossimi sheep continued to express higher maternal behaviour than that of Barki or Rahmani breeds.

Table 2. The effect of breed of sheep on maternal behaviour displays exhibited at one week after lambing

Factor Displays	Breed									Sig.
	Ossimi			Barki			Rahmani			
	No	\bar{X}	S.E.	No	\bar{X}	S.E.	No	\bar{X}	S.E.	
A. Mother acts:										
1. Time of licking head (min)	10	1.2 a	0.18	11	0.7 b	0.19	15	0.8 ab	0.15	*
2. Time of licking the rest of body (min)	10	0.8 a	0.19	11	0.4 a	0.11	15	0.5 a	0.09	
3. Time of licking the rear part (min)	10	4.8 a	0.75	11	2.2 b	0.31	15	3.0 b	0.32	**
4. Total time of licking (min)	10	7.1 a	0.77	11	3.6 b	0.54	15	4.8 b	0.47	**
5. Frequency of licking head	10	51.4 a	6.13	11	29.4 b	6.66	15	34.3 b	4.11	*
6. Frequency of licking the rest of body	10	40.6 a	7.77	11	22.1 b	4.40	15	27.1 ab	3.51	*
7. Frequency of licking the rear part	10	114.7 a	8.80	11	87.0 ab	11.91	15	82.2 b	9.12	*
8. Total frequency of licking	10	206.7 a	19.18	11	138.6 b	21.09	15	143.6 b	14.25	*
9. Frequency of low-pitched bleats	10	32.9 a	11.76	8	14.8 a	7.28	14	46.2 a	9.14	
10. Frequency of high-pitched bleats	9	183.6 a	59.14	10	227.9 a	61.06	13	89.1 a	28.85	
11. Time of nursing bouts (min)	10	8.4 a	1.66	11	10.5 a	1.66	15	4.4 b	0.57	*
12. No. of nursing bouts	10	31.7 a	5.92	11	31.3 a	4.82	15	21.1 a	2.58	
13. No. of rejections	10	74.2 a	23.88	11	87.1 a	22.24	15	136.0 a	24.02	
B. Lamb acts:										
1. Frequency of sniffing mother	10	21.3 a	4.17	11	22.0 a	5.42	15	21.0 a	3.68	
2. Frequency of licking mother	9	28.7 a	4.81	11	26.5 a	6.00	15	48.7 b	5.93	*
3. No. of lammings	2	30.5 a	28.50	1	1.0 a	-	5	1.6 a	0.40	

Means in rows not followed by the same letter differ significantly from each other ($P < 0.05$) using Duncan's Multiple Range Test.

Sig.: significance of difference

* $P < 0.05$

** $P < 0.01$

Regarding lamb acts, It is apparent from Table 2 that Rahmani lambs significantly ($P < 0.05$) licked their mother more compared to Ossimi and Barki lambs which licked their dams similarly.

2.2. The effect of parity

With the exception of time of nursing bouts, it was found that parity did not affect any of the studied acts, whether for mother or lamb, in a significant way when lambs were one week old. However, time of nursing bouts for primiparous ewes (9.9 min) was significantly ($P < 0.05$) longer than that of multiparous ones (6.1 min).

2.3. The effect of sex of lamb

Results obtained showed that at one week after lambing, time of nursing bouts was significantly ($P < 0.01$) longer (9.7 min) and number of nursing bouts was also significantly ($P < 0.05$) more (33.6 times) for ewes with males than those with female lambs (5.5 min and 22.0 times, respectively). All other mother or lamb acts did not significantly differ by difference in sex of lamb.

CONCLUSION

There are maternal differences among Egyptian breeds of sheep. Ossimi sheep exhibited more intense maternal behaviour than Barki and Rahmani sheep. Hence additional post-lambing care of lambs should be given to Barki and Rahmani sheep to improve their lambs survival rate. Experience of ewe plays an important role in establishing the mother-young bond. Maternal and neonatal behaviour displays were not affected by sex of lamb.

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السلوك الأموي والبنوي فى الأغنام المصرية متأثراً بالسلالة وترتيب موسم الولادة وجنس الحمل

أحمد يحيى عبد المنعم، ممدوح سيد عبد الله

قسم الإنتاج الحيوانى ، كلية الزراعة، جامعة القاهرة، الجيزة، مصر

استخدم عدد 33 نعجة أوسيمى ورحمانى وبرقى وحملانهم البالغ عددهم 36 حمل لدراسة تأثير السلالة وترتيب موسم الولادة وجنس الحمل على السلوك الأموي والبنوي خلال الساعة الأولى بعد الولادة وعند أول أسبوع بعد الولادة .

كانت سلوكيات الأمومة لأغنام الأوسيمى، خلال الساعة الأولى بعد الولادة مباشرة، أعلى من السلالات الأخرى. استغرقت نعاج الأوسيمى وقتاً أطول فى لعق رأس الحمل (8.4 دقيقة) وباقي أجزاء جسمه (9.7 دقيقة) وكل جسم الحمل (30.7 دقيقة) من نعاج البرقى (7.8 و 7.3 و 29.9 دقيقة، على التوالى) أو من نعاج الرحمانى (4.2 و 5.4 و 21.2 دقيقة، على التوالى). وبالمثل، أظهرت نعاج الأوسيمى تكرارات أعلى معنوياً (إحتمال أقل من 0.01) للتعق رأس الحمل (127 مرة) وباقي أجزاء الجسم (149.3 مرة) وكل الجسم (431.6 مرة) تبعها أغنام البرقى (109.6 و 131.1 و 413.6 مرة، على التوالى) ثم أغنام الرحمانى (64.4 و 74.8 و 225.1 مرة، على التوالى). إضافة إلى ذلك، أنجزت حملان الأوسيمى أعلى عدد من محاولات الرضاعة (17.8) خلال الساعة الأولى بعد الولادة مباشرة، تبعها حملان البرقى (16.7) ثم حملان الرحمانى (9.2) ، حيث وجد اختلاف معنوى (احتمال أقل من 0.05) بين حملان الأوسيمى وحملان الرحمانى . وعند الأسبوع الأول بعد الولادة ، استمرت أغنام الأوسيمى فى التعبير عن سلوكيات الأمومة أفضل من أغنام البرقى و أغنام الرحمانى. لم يكن لترتيب موسم الولادة وجنس الحمل تأثيراً واضحاً على كل من السلوك الأموي والسلوك البنوي .