

MATERNAL BEHAVIORS OF SAANEN X HAIR GOAT CROSSES AT PARTUM AND EARLY POSTPARTUM DOE-KID RELATIONSHIPS

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Abstract. The purpose of this study was to describe maternal behavior of Saanen x Hair Goat crosses during and shortly after parturition and to determine the effect of some factors on doe-kid relationship. Parturition length, drying the kid by licking characteristics, time taken for placenta expulsion were taken as partum and postpartum behavior characteristics. Parturition length, time taken to lick, licking duration and time taken for placenta expulsion were found to be 129.8, 2.4, 21.35, 222.7 min, respectively. Behavior traits belonging to kids were first attempt to stand up, time taken to stand up, first attempt to suckle and time taken to suckle, which were 5.7, 28.9, 38.8, 67.5 min, respectively. There was a positive correlation between time taken for placenta expulsion and licking. There was a significant correlation between first attempt to suckle and other traits ($P < 0.05$).

Keywords: *goat, Saanen x Hair crosses, parturition behavior, maternal behavior*

Introduction

Behavior is defined as the changes happening to the whole or some parts of the body of animals due to intrinsic or extrinsic factors (Unal and Akcapinar, 1994). Behavior makes animals adapt to internal changes of their body or the environment surrounding it. Most animals have behavior traits to try to benefit from their surroundings. Thus with trial and error behavior they adapt to their environment. When the animal does not have a previous experience, all behavior traits have a basic stimulant establishing the behavior. Understanding the basic stimulants peculiar to species is the fundamental part to understand animal's behavior and to control it (Demiroren, 2002). Before the animals were domesticated, humankind easily hunted wild animals by observing their behaviors. Later on humans either intentionally or unintentionally used animal behaviors especially social behaviors as selection criteria (Shackleton and Shank, 1984). At the root of some behaviors there are both instinct and experience. For example teat seeking behavior is instinctive however finding teats is by trial and error (Taylor and Field, 2001).

It is essential to test both maternal traits and care, and both offspring traits and development, as well as environmental factors, against offspring survival to disentangle the direct and indirect determinants of juvenile survival, a fundamental component of population dynamics (Gaillard et al., 1998). In addition, maternal efforts to maintain proximity with her young can directly enhance offspring survival by reducing predation risk (Grovenburg et al., 2012).

Goats have a keen sense of smell and good hearing. With the help of these senses they are able to find their kids within the group, select the grasses on pasture, distinguish the voices and establish mother-kid bond (Mackenzie, 1993). The most important behavior displayed after the birth is maternal behavior. Several factors such

as age, parity, kid's feeding, breed, birth type, kid's stimuli (temperature, suckling, and movement) affect maternal behavior (Unal and Akcapinar, 1994).

Damron (2003) stated that maternal behavior is a complex relation that emerges after the birth, establishes bond between dam and kid, increases welfare and survival rate of the kid and increases lifelong yield of the kid.

Knowing kids behavior is very helpful as post-partum activities of kid such as, standing up and suckling, are very important for survival. When the mother lacks maternal behavior this may result in the low survival rate of the kid, death loss in first week due to undernutrition. Criteria that contribute to postnatal vitality that subjectively evaluate vitality of the kids are attempt to stand up and suckling behavior (Werning, 1993; Herpin et al., 1997; Cloete and Scholtz., 1998; Wollny, 2000; Leenhouders et al., 2001).

The development of the connection between the mother and the new born kid was initially established at the time of birth through scent, and therefore the active licking is essentially important (Dwyer and Lawrence, 1998). Purpose of this study is to define and obtain data on maternal behaviors of Saanen X Hair Goat crosses at partum and early postpartum doe- kid relationships.

Materials and methods

Research was conducted in Small Ruminant Research farm at Suleyman Demirel University Applied Agricultural Research Center. Material of the study consisted of 22 female Saanen goats and their 36 kids. During the study goats were grazed on shrub and wheat stubble field. Goats received supplemental feed prior to parturition or when the grazing was insufficient.

Considering the insemination time and behavior, the goats that were going through labor were observed until birth took place. The goats approaching labor were transferred to a different paddock where their partum behavior were observed by 5 cameras recording from different angles. Behavior of kids were observed during parturition and maternal behavior of goats were recorded. Birth weight of kids were recorded right after kids were dried. When recording the behaviors, digital watch with a sensitivity of seconds was used and times were recorded.

Maternal behavior parameters recorded during the study were parturition length, licking properties (time taken to lick, licking duration) and placenta expulsion time. Kids behavior parameters recorded during the study were time taken to first attempt to stand up, time taken to first attempt to suckle and suckling duration.

During the study, goats that are going to give birth within two days were separated and housed in birth paddocks. Goats giving birth were observed for 24 h. Definition of parturition and maternal behavior is presented below:

Parturition length (min): Time between first contraction and birth,

Time taken to lick (min): Time between parturition and mother's first lick,

Licking duration (min): Time between first and last lick (Dwyer et al., 2000),

Placenta expulsion time: Time between birth and expulsion of placenta,

Kid's first attempt to stand up (min): Time between birth and first attempt to stand up.

Results and discussion

Maternal properties such as parturition length, time taken to lick, licking duration, placenta expulsion time, and kids behavior parameters such as time taken to first

attempt to stand up, time taken to first attempt to suckle and suckling duration are examined under two different subject. Descriptive data on parturition length, time taken to lick, licking duration, placenta expulsion time are provided in *Table 1*. When the data is examined it can be inferred that maternal behavior has a wide range.

Table 1. Descriptive data on maternal behavior

Properties	Mean	Minimum	Maximum
Parturition length (min)	129.8	1	442
Time taken to lick (min)	2.4	0	27
Licking duration (min)	21.35	16	238
Placenta expulsion time (min)	222.7	33	488

Parturition length

Of the maternal behavior, the most extensively examined property by researchers is parturition length and is defined as the time taken between first contraction and birth. Results showed that mothers giving birth at age of two had parturition length of 150 min and this was longer than older goats. As it can be seen in *Table 1*, the shortest parturition length was observed in 4-year-old goats (90 min) followed by 5- and 6-year-old goats (135, 144 min). Konyali et al. (2004) reported that in Turkish Saanen goats birth was given in 25 min after the labor started. However, in a research conducted on Gökçeada, Maltiz and Turkish Saanen goats, Tölü et al. (2013) found that parturition length ranged between 5.6 and 8.9 min and reported that the reason for this discrepancy was the definition and evaluation of parturition length in different studies. Tambajong (2002) found that birth was given in 131.8 min after the first labor started and in twin births second kid was born 22.3 min after the first kid was born. Parturition length is affected by birth type. Some researchers evaluating the parturition length reported that in twin births first kid was born between 14.5 and 131.8 min and second kid was born between 6 and 22 min after the first kid was born (Sambraus and Wittman, 1989; Ramirez et al., 1995; Das and Tomer, 1997; Tambajong, 2002). Parturition length for single and twin births was found 97.06 and 161.87 min, respectively, and it was observed that birth type had a significant effect on parturition length ($P < 0.01$). As litter size increased parturition length increased. Parturition length was not affected by dam's age. These results agree with Sambraus and Wittman, 1989; Ramirez et al., 1995; Das and Tomer, 1997; Tambajong, 2002 who worked on different breeds. When the range in descriptive data of maternal behavior is considered, it is likely possible that there was a difficulty in finding the correct definition for labor.

Drying properties

This parameter was examined to define the first orientation or interest in small ruminants after parturition. After the birth, as a first act, small ruminants look for their kids or feed, water or similar objects. Mother commences to lick the kid soon after the birth. Time taken to lick (TTL) is defined as the time between birth and first licking action. Licking duration (LD) is the time taken between first and last licking. Acceptance of kid by mother and time taken to lick vary depending on the mother's age. As mother gets older acceptance of kid by mother and time taken to lick shorten (3.46, 2.17, 1.81 and 2.11 min, for 2, 4, 5 and 6 year ages, respectively). Average duration for

TTL was 21.35 min. The shortest TTL was observed in 5-year-old mothers whereas longest TTL was observed in 2-year-old mothers. Mother's age had no effect on searching for kid ($P > 0.05$). Pushing the kids by head and front limbs and licking of kids to have them stand up are important to stimulate the kids to suckle (Konyali et al., 2006). Yilmaz et al. (2012) reported that TTL varied between 13.2 and 42.2 s and mother first starts licking from head. In a research on Toggenburg and Saanen goats, Lickliter (1985) reported that TTL was between 60 and 90 s.

Placenta expulsion time

As it is observed in *Table 2*, dam's age and birth type had no effect on placenta expulsion time ($P > 0.05$). Average time for placenta expulsion time was 222.69 min. Even though it was not significant, placenta expulsion time increased as age of dam increased. Konyali et al. (2006) reported that placenta expulsion took place in one to two hours. In another research conducted on Norduz goats Yilmaz (2012) reported that placenta expulsion time was 120.74 min. In a study conducted on goats, Konyali et al. (2004) reported that dam's age had a significant effect on placenta expulsion time and placenta expulsion time decreased as dam's age increased (146 min for 2 years old goats, 115 min for 3 years or above).

Table 2. Means and standard errors for mother's age and the birth type (min)

	Parturition length (min)	Time taken to lick (min)	Licking duration (min)	Placenta expulsion time (min)
Mother's age				
2	150.03±17.84	3.46±60.10	23.5±14.2	189.09±23.49
4	90.14±22.18	2.17±58.36	24.0±13.3	197.18±29.04
5	135.22±23.07	1.81±20.42	19,3± 20.4	237.88±30.19
6	144.35±27.47	2.11±21.70	18.6±17.5	266.38±36.26
Birth type	**		*	
Single	97.06±20.33	2.27±1.32	18,09±11.8	194.36±22.16
Twin	161.87±17.48	2.51±0.92	24,61±16.9	250.34±37.61
Mean	129.87±9.84	2.38±0.60	21,35±17.5	222.69±30.19

* $p < 0.05$, ** $p < 0.01$

Kids' behaviors

Behaviors belonging to kids such as first attempt to stand up, time taken to stand up, first attempt to suckle, time taken to suckle are presented in *Table 3*.

Table 3. Descriptive data on kids' behavior

Properties	Mean	Minimum	Maximum
First attempt to stand up (min)	5.7	1	96
Time taken to stand up (min)	28.9	4	160
First attempt to suckle (min)	38.8	1	211
Time taken to suckle (min)	67.5	8	201

First attempt to stand up and time taken to stand up

Post partum activities of kids (standing up and suckling) are very important for the kids' survival. These traits are influenced by mothers' and kids' behaviors. First attempt to stand up and time taken to stand up are presented in *Table 3*. Mother's age had no effect on first attempt to stand up and time taken to stand up ($P > 0.05$; *Table 4*). When the first attempt to stand up time is examined it is observed that as mother's age increased first attempt to stand up time increased. The only exception to this were 6 years old mothers that showed similar results with 2 years old mothers. Time taken to stand up followed the same trend as the first attempt to stand up and kids of two years old mothers stood up earlier than other mothers' kids. Sex of kid had no influence on time taken to stand up ($P > 0.05$). Similar results were reported by Cloete et al. (2002) who found that sex had no impact on time taken to stand up. Lickliter (1985) reported that most of the kids (62%) stood up in 15 min after the birth. In a study conducted on Boer goats Tambajong (2002) reported that of the twins, first born twin stood up in 28 min whereas second born stood up in 36 min. A study comparing time taken to stand up of Turkish Saanen kids with Gokceada and Maltase found that Saanen kids needed longer time (20.9 min) than Gokceada and Maltase kids ($P < 0.05$). In addition to birth weight and APGAR score, mother's attention on kid has an effect on time taken to stand up (Dwyer, 2003; Savas, 2007). Konyali et al. (2006) reported that single born kids stood up in 23.5 min and of the twins, first born and second born stood up in 24.9 and 27.5 min, respectively. Research showed that Gokceada and Maltase kids have shorter time taken to stand up. Time taken to stand up is affected by birth weight and lighter Gokceada kids stand up earlier than heavier Saanen kids. In this study it is interesting to observe that twins took less time than single born kids to stand up and this result contradicts with literature. However, obtained results with regards to time taken to stand up are in agreement with literature.

Suckling behavior

Survival of kids mostly depend on standing up and suckling in the shortest time possible. In this research kids born to 2, 4, 5 and 6 years old mothers needed 44.2, 50.3, 26.9 and 33.8 min for first attempt to suckle, respectively, and 66.5, 76.1, 57.7 and 69.6 min for time taken to suckle (*Table 4*). This showed that mother's age had influence on these behaviors. Kids born to 2 and 4 years old mothers tended to have longer time for first attempt to suckle, and kids born to 4 years old mothers tended to have longer time for time taken to suckle. In a study conducted on Toggenburg and Saanen goats Lickliter (1985) reported that time taken to suckle ranged between 14 and 185 min with average of 49 min. Birth type and sex had no effect on first attempt to suckle and time taken to suckle. Mean time for first attempt to suckle and time taken to suckle were 38.8 and 67.5 min, respectively.

Phenotypic correlations among behavior traits

Correlation analyses were performed to document relationship among traits. The results are reported in *Table 5*. As parturition length increased placenta expulsion, drying traits, time taken to stand up and first attempt to suckle time increased. These results are expected as these behavior traits are displayed after parturition. There was a positive correlation between placenta expulsion time and drying traits. There were important correlations among first attempt to suckle and other traits. As parturition length increased

placenta expulsion time increases naturally. Increase in parturition length affects first attempt to stand up as mother spends more energy and is under stress. The same way, increase in placenta expulsion time affects drying traits, time taken to stand up and first attempt to suckle. Time taken to stand up also affects first attempt to suckle and time taken to suckle as they are correlated and dependent to each other.

Table 4. *Mother's age, birth type and sex on kids' behavior*

	First attempt to stand up (min)	Time taken to stand up (min)	First attempt to suckle (min)	Time taken to suckle (min)
Mother's age				
2	4.5±4.0	24.8±8.0	44.2± 8.0	66.5±11.7
4	6.5±5.3	30.3±8.3	50.3±10.6	76.1± 9.8
5	6.7±5.6	29.5±6.1	26.9±11.3	57.7±12.6
6	5.1±6.3	31.2±9.1	33.8±11.4	69.6±13.5
Birth type				
Single	6.7±14.3	32.6±10.6	44.7±12.3	60.7±14.8
Twin	3.4± 7.0	23.8±5.2	32.4± 7.5	74.3± 8.4
Sex				
Male	6.2±3.6	29.3±5.7	39.7± 7.6	70.0± 8.9
Female	4.0±3.1	27.2±4.5	37.5± 6.1	65.2± 7.2
Mean	5.7±10.1	28.29±3.93	38.8±5.26	67.50±5.21

Table 5. *Phenotypic correlations among behavior traits*

	Parturition length	Placenta expulsion time	Time taken to lick	Licking duration	First attempt to stand up	Time taken to stand up	First attempt to suckle	Time taken to suckle
Parturition length	1.000	0.280*	0.448**	0.243*	0.055	0.294**	0.224*	-0.002
Placenta expulsion time		1.000	0.294**	0.280**	0.118	0.371**	0.275*	0.142
Time taken to lick			1.000	0.237*	0.414**	0.363**	0.325**	-0.045
Licking duration				1.000	0.387**	0.250*	0.371**	-0.111
First attempt to stand up					1.000	0.626**	0.055	0.226*
Time taken to stand up						1.000	0.807**	0.215
First attempt to suckle							1.000	0.112
Time taken to suckle								1.000

*p < 0.05, **p < 0.01

Conclusions

Post partum behavior of mother is linked to kid's survival. Knowing post partum behavior of mother and kids are important to reduce mortality rate in kids and to increase survival of kids. First contact between mother and kid starts with mother's lick. Licking action normally should start right after the birth. Thus breeders should pay attention to mothers' licking behavior and should control the environmental factors adversely affecting mother's behavior (hunger, cold, diseases). In addition breeders should pay attention to mothers having dystocia and should locate these mothers and kids in individual paddocks. This practice would benefit the kids as mother would give all attention to the kids. As a result, it can be inferred that behavior traits of mother and kids should be defined under different conditions. In this case problems related to mother and kid behavior can be controlled and some breeding techniques to increase productivity can be implemented.

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