



## REVIEW ARTICLE

### THE EFFECT OF LATE PREGNANCY ON TEAR SECRETION IN ROMANOV SHEEP

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#### ABSTRACT

The aim of this study was to investigate the effect of late pregnancy on tear secretion in Romanov sheeps. The study material consists of a total of 54 Romanov breed sheep, with pregnant (n = 27, group 1) and non pregnant (n = 27, group 2) housed under the same care and nutrition conditions between ages 9 months - 4 years old. Tear secretion was measured with Schirmer Tear Test (STT) respectively. It was found that tear production levels in the Group 1 ( $12.48 \pm 3.72$  mm/min) were not significantly different than the Group 2 ( $11.59 \pm 4.07$  mm/min) with a p value of 0,406. As a result, we think that there is not enough study about tear secretion in late pregnant sheep and this study is also important for future studies.

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## INTRODUCTION

The precocular tear film comprises the secretions of several glands (Aguirre *et al.*, 1995; Izci *et al.*, 1995; Izci, 1995). The precocular tear film distribution occurs as a result of the movements of the lower and upper eyelids, and the third eyelid (Slatter, 1990; Wilkie, 1993). Tears play an significant role in maintaining the health and normal function of the conjunctiva and cornea. Tears help remove foreign matter, provide essential nutrients to the a vascular cornea, and contain immunoglobulins, lysozymes, and other proteins important for the defenses of the eye (Gum, 1991). Reduction in tear production causes increased corneal inflammation and ultimately damage that may lead to blindness (Sansom and Barnett, 1985). Deficiency in tear production results in inflammation of the conjunctiva and cornea known as dry eye, xerophthalmia, or keratoconjunctivitis sicca (Aguirre *et al.*, 1995; Izci *et al.*, 1995). Measurement of tear production is an important diagnostic test when deficiency of the lachrymal system is suspected. The tear-producing system is evaluated qualitatively by examination of the surface for moistness and quantitatively by the Schirmer tear test (STT), widely used in both human and veterinary ophthalmology for evaluating aqueous tear production (Williams, 2005). Some studies have investigated tear secretion in some sheep and goat breeds (Ghaffaria *et al.*, 2011; Ribeiro *et al.*, 2010). It was reported that in healthy Sanjabi sheep aged 2-3 years (Ghaffaria *et al.*, 2011), the average tear secretion was  $18.52 \pm 2.55$  mm/min.

Among Brazilian Saanen goats (Ribeiro *et al.*, 2010), tear secretion values on days 45, 180 and 549 were found to be  $10.38 \pm 0.23$ ,  $14.83 \pm 0.33$  and  $13.80 \pm 0.66$  mm/min, respectively. However, more reference information is needed for these animals since tear secretion are affected by many factors including breed varieties and ecological environment (Ghaffaria *et al.*, 2011). The current literature indicates that there aren't sufficient number of studies tear secretion in pregnant sheep, with no specific reference addressing these parameters on Romanov sheep. The aim of this study was to investigate the effect of late pregnancy on tear secretion in Romanov sheeps.

## MATERIALS AND METHODS

**Animals:** The study material consists of a total of 54 Romanov breed sheep, with pregnant (n = 27, group 1) and non pregnant (n = 27, group 2) housed under the same care and nutrition conditions between ages 9 months -4 years old at Siirt University Goat Research and Application Center.

**Experimental Design:** Prior to the study, all animals underwent thorough clinical and ophthalmoscopic examinations, of which the healthy cases were selected as candidates for the experimentation. The tear secretion using STT (Schirmer Tear Test, ERC, Turkey), respectively. The animals were placed in a closed and low light area for the application of the tests. Study was applied at 10:30-12:30 am and ambient temperature was measured at 9 °C by a digital thermometer.

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All measurement procedures were carried out by the same investigator. Tests were carried out by the same researcher on the left eye of the test subject, which were properly taken at control on their feet by caretakers. The results were processed into the prepared chart. The test strip was placed towards the test subject's the lower fornix through the middle third of the eye and the outer third of the eye by folding it about 5 mm from its upper end. At the end of 1 min. waiting time, test was performed and the numerical value on it was recorded.

**Statistical Analyses:** Variables were examined by Shapiro-Wilk Test to determine whether data has normally distributed. The assumption of homogeneity of variance is tested by using Levene's Test of quality of Variances. Inspection of the results affirmed that tear production was normally distributed for both groups and there was homogeneity of variance as assessed by Levene's Test for Equality of Variances. Accordingly, Independent Samples T-test was run on the data.

## RESULTS AND DISCUSSION

Twenty seven pregnant Romanov sheep and twenty seven non pregnant sheep were used in the study. Romanov sheeps ranged from 9 months to 4 years old. The mean values of tear production in both groups are depicted in Table 1.

**Table 1. Mean (Mean  $\pm$  SE) and Median (Min-Max) values in both groups**

Group	N	Mean	SE	Min.	Max.
1	27	12,48	$\pm 3.72$	6	20
2	27	11,59	$\pm 4.07$	5	20

All data were expressed in units of based on mm/min. The data were reported as mean  $\pm$ SD. The STT values were measured in group 1 as  $12.48 \pm 3.72$  mm/min in the left eye. The STT values were measured in group 2 as  $11.59 \pm 4.07$  mm/min in the left eye. It was found that tear production levels in the Group 1 ( $12.48 \pm 3.72$  mm/min) were not significantly different than the Group 2 ( $11.59 \pm 4.07$  mm/min) with a p value of 0,406. The pre-ocular tear film is essentially a trilaminar film composed of an inner mucus layer, a wide central aqueous layer, and an outer lipid layer (Carrington *et al.*, 1987). The mucus layer is secreted by goblet cells present in the conjunctiva, concentrated particularly in the lower conjunctival sac (12). This layer is believed to allow adherence of the tear film to the corneal surface (Carrington *et al.*, 1987). The aqueous layer is produced by the lacrimal and nictitans glands (approximately 70% and 30%, respectively) and makes up the bulk of the tear film (Carrington *et al.*, 1987). The meibomian glands, which are modified sebaceous glands, are present along the eyelid margins (Sullivan *et al.*, 1998). These are responsible for producing the lipid layer that is thought to stabilize the tear film and reduce evaporative loss (Carrington *et al.*, 1987, Kern *et al.*, 1988). The STT devised by Otto Schirmer a century ago has been widely used in both human and veterinary ophthalmology as a basic assessment of tear production (Williams, 2005). The STT I evaluates the patient's basal and reflex tearing ability, while the STT II evaluates the basal tear production after application of a topical anesthetic to the globe and conjunctiva (Beech *et al.*, 2003). STT results can vary depending on inconsistencies in the absorptive capacities of STT strips due to differences in filter papers, the individual

performing the test and location of strip placement within the conjunctival sac (Rothschild *et al.*, 2004). In the present study, we used the STT I for evaluation of baseline STT values in this specie. All measurements were performed by one examiner and STT values obtained by strips of the same manufacture (Schirmer Tear Test, ERC, Turkey). Normal tear secretion and IOP values have been reported in many domestic species (Biricik *et al.*, 2003; Broadwater *et al.*, 2007). However, there are only few reports about normal values of these variables in sheep and goats (Ghaffaria *et al.*, 2011; Ribeiro *et al.*, 2010). In this study, it was aimed to investigate the effect of late pregnancy on tear secretion in Romanov sheeps. Ghaffaria *et al.*, (2011) measured average tear secretion as  $18.52 \pm 2.55$  mm/min in Sanjabi sheep aged 2-3 years. Ribeiro *et al.*, (2010) reported that among Brazilian Saanen goats, which were 45, 180 and 549 days old, average tear secretion values were  $10.38 \pm 0.23$ ,  $14.83 \pm 0.33$  and  $13.80 \pm 0.66$  mm/min, respectively. Broadwater *et al.*, (2007) found that the average STT value was 15.8 mm/min and the average in Gygy goats aged 5-11 years. In our study, the STT values were measured in group 1 as  $12.48 \pm 3.72$  mm/min in the left eye. The STT values were measured in group 2 as  $11.59 \pm 4.07$  mm/min in the left eye. It was found that tear production levels in the Group 1 ( $12.48 \pm 3.72$  mm/min) were not significantly different than the Group 2 ( $11.59 \pm 4.07$  mm/min) with a p value of 0,406.

## Conclusion

Since breed, sex, age, body weight, skull structure, ecological environment in which the animals are bred, are the factors affecting tear functions, all these individual and environmental factors should be taken into consideration to assess tear secretion accurately. Although there are many studies on tear secretion in sheep, there is no information about the effect of advanced pregnancy on tears in the literature. As a result, it was determined that pregnancy had no effect on tear secretion.

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