

The Relationship between Neonatal Lamb Mortality and Toxoplasmosis

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Abstract: In this study, it was aimed to reveal the relationship between neonatal lamb mortality and toxoplasmosis. The study was carried out in a sheep farm that declared the death of lambs. Brood ewes (N= 50) were included into the study and they were divided into 2 groups. The first group consisted of 25 sheep whose lambs had died, and the second group consisted of 25 sheep whose lambs were alive. Blood samples were collected from the two groups and the blood sera were obtained. The sera were examined with the Sabin-Feldman Dye Test for the antibodies against *Toxoplasma gondii* (*T. gondii*). Of the 50 blood sera examined, 29 (58%) were positive for *T. gondii*, 20 (80%) of which were from the sheep whose lambs had died. On the other hand, only 9 (36%) of 25 blood sera from the sheep with healthy lambs were found to be positive. The frequency of *T. gondii* infestation was statistically evaluated by chi-square test and the difference between the two groups was found to be significant. (p<0.05). The results of the study showed that toxoplasmosis can play an important role in lamb mortality.

Keywords: Neonatal lamb, Sheep, *Toxoplasma gondii*.

Neonetal Kuzu Ölümeleriye Toxoplasmosis İlişkisi

Özet: Bu çalışma, neonatal kuzu ölümleri ile toxoplasmosis arasındaki ilişkiyi ortaya koymak amacıyla yapılmıştır. Çalışma kuzularının öldüğünü beyan eden işletmede gerçekleştirilmiştir. İşletmeden 50 adet anaç koyun seçilerek çalışmaya dahil edilmiş ve bunlar iki gruba ayrılmıştır. Birinci (1.) grup 25 adet kuzusu ölmüş koyunlardan, 2. grup ise 25 adet kuzusu sağ koyunlardan oluşturulmuştur. Bu iki gruptan tekniğine uygun olarak kan alınıp, serumları çıkarılmıştır. Daha sonra bu serumlar Sabin-Feldman dye testi ile incelenmiştir. İncelenen 50 adet kan serumundan 29'unda (%58) *Toxoplasma gondii* saptanmıştır. Kuzusu ölen 25 adet koyundan alınan kan serumlarının 20'sinde (%80) *T. gondii* pozitif olarak tespit edilmiştir. Kuzusu sağ olan 25 koyundan alınan kan serumlarının 9'unda (%36) etken pozitif olarak tespit edilmiştir. Bu iki grup arasında *T. gondii* bulunma sıklığının istatistiksel olarak ki-kare testi ile karşılaştırıldığında aralarındaki fark önemli bulunmuştur (p<0.05). Sonuç olarak, toxoplasmosis kuzu ölümlerinde önemli bir rol oynayabilir.

Anahtar kelimeler: Neonatal lamb, Koyun, *Toxoplasma gondii*.

Introduction

Toxoplasmosis is a zoonotic infection affecting almost all organisms including mammals, reptiles and poultry (Soulsby, 1986). The disease causes encephalitis in addition to its effect on other organs and tissues. The disease is commonly subclinical in mammals. However clinical toxoplasmosis can be seen in immuno-deficient patients. In addition to neurological symptoms such as undefined ataxia, pain, fever, headache and drowsiness other symptoms including growth in lymph nodes, muscle pain, fatigue, sore throat, urticaria, pneumonia, blindness, liver, heart and lung problems may also be seen in patients with toxoplasmosis (Tüzer and Toparlak, 1999).

Toxoplasma gondii is a protozoon that appears in all mammals, reptiles and poultry. The agent is an obligatory intracellular parasite and may grow in all cells except for erythrocytes (Soulsby, 1986). Toxoplasmosis is a zoonotic disease and can infect

humans in addition to farm animals. It was reported that sero-positivity for *T. gondii* increases with the advancing ages of all animals. Felines are the most important contagious source of toxoplasmosis. The known habits of felines to bury their stool play a major role in the continuity of the parasite's life cycle since this prevents the oocysts from being directly exposed to sunlight. In addition, cockroaches, houseflies and other arthropods also help spread the oocysts in stools (Dubey, 2009). Toxoplasmosis is reported in people of all age, sex and socio-economic groups from every region of Turkey (Tüzer and Toparlak, 1999).

According to the data of Turkish Statistics Institution there are 31.507.934 sheep in Turkey. There are 277.439 sheep in the province of Isparta. There are 124.262 sheep in the Yalvaç district. As being among the major sources of subsistence of people in villages sheep breeding has great

contribution to economy of Turkey (Anonymous, 2016).

Success in economic sheep breeding is measured by the number of lambs grown and sold. This success is greatly decreased by lamb mortality during the growing period. Neonatal lamb mortality causes serious economic losses in our country. In a study conducted in the province of Kars, the morbidity rate of the lambs was reported to be 48.6% (Gökçe and Erdoğan, 2009). Ovine toxoplasmosis causes important economic losses to livestock industry worldwide (Dubey and Beattie, 1988; Buxton et al., 2007). Furthermore, contaminated sheep meat is a source of *T. gondii* infection for humans (Soulsby, 1986). There are several studies showing relationship between antibody titers against *T. gondii* in the ewes and neonatal mortality of lambs (Buxton et al., 2007, Reif et al., 1989).

The aim of this study was to investigate the relationship between neonatal lamb mortality and serum anti-toxoplasmosis antibody titers of ewes.

Materials and Methods

This study was carried out on a sheep farm raising 200 ewes in Yalvaç district of Isparta province in 2016. The breeder reported a high neonatal lamb mortality within the first week of lambing. Post mortem examinations of the lambs did not reveal any gross pathological findings. Therefore, a serological test was planned based on the suspect for toxoplasmosis. A total of 50 blood samples from two groups of brood ewes were taken. The first group consisted of 25 sheep whose lambs had died within a week, and the second group consisted of 25 sheep whose lambs survived. Sera were obtained from the coagulated blood samples by centrifuging at 4000 rpm for 10 minutes. The sera were examined for antibodies against *T. gondii* by using Sabin-Feldman Dye Test (Babür et al., 1996, Dubey and Beattie, 1988, Eckert et al., 1992, Sabin and Feldman, 1948) in the Ankara Parasitology Laboratory of the Turkish Public Health Institution. Samples carrying antibody titers over 1/16 were considered positive for *T. gondii*.

Statistical analysis: Differences with respect to sero-prevalence among the two groups were analyzed by using chi-square test and probabilities less than 0.05 were considered to be statistically significant (Özdamar, 2002). Statistical analysis was performed with SPSS version 16.0.

Results

Of the 50 blood sera examined, 29 (58%) were positive. 20 (80%) of 25 blood sera collected from the sheep whose lambs had died, were found to be positive for *T. gondii*. On the other hand, 9 (36%) of 25 blood sera collected from the sheep with healthy lambs were found to be positive (Table 1). The difference between the two groups was significant when the frequency of *T. gondii* was statistically assessed by the chi-square test. ($X^2:9.93$ $p<0.05$)

Table 1. Distribution of *Toxoplasma gondii* incidence according to the study groups.

| Study Groups | <i>T. gondii</i> .(+) | <i>T. gondii</i> . (-) | Total |
|--|-----------------------|------------------------|------------|
| | Number (%) | Number (%) | Number (%) |
| I. group sheep whose lambs had died | 20 (80) | 5 (20) | 25 (100) |
| II. group sheep whose lambs were alive | 9 (36) | 16 (64) | 25 (100) |
| Total | 29 (58) | 2 (42) | 50 (100) |

Of the 29 blood sera positive for *T. gondii*, 18 (62.1%) had antibody titers of 1/16, 8 (27.6%) had 1/64 and 3 (10.3%) had 1/256. (Table 2)

Table 2. The rates of *T. gondii* seropositive blood sera at different titers.

| Titer rates | Number | | Alive | | Mortality | |
|-------------|--------|-----|--------|-------|-----------|------|
| | Number | % | Number | % | Number | % |
| <1/16 | 21 | 42 | 16 | 76,19 | 5 | 23,8 |
| 1/16 | 18 | 36 | 8 | 44,44 | 10 | 55,6 |
| 1/64 | 8 | 16 | 1 | 12,50 | 7 | 87,5 |
| 1/256 | 3 | 6 | 0 | 0,00 | 3 | 100 |
| Total | 50 | 100 | 25 | 25 | | |

As can be seen in the Table 2 the mortality rates of the lambs showed an increase along with the maternal antibody titers.

Discussion and Conclusions

Sheep breeding is very important for the economy of Turkey. Therefore, lamb mortality causes considerable economic loss in the sheep breeding enterprises (Yumuşak and Aksoy, 2014). Besides other infectious diseases such as brucellosis and campylobacteriosis, toxoplasmosis also plays an important role in lamb mortality (Aköz et al., 2009; Aktaş et al., 2000; Arda et al., 1987; Mabuk et al., 2013; Sevinç et al., 2000). Many studies have indicated that lamb mortality is associated with

toxoplasmosis (Castano et al., 2019; Dubey and Kirkride, 1990; Dubey et al., 1990; Edwards and Dubey, 2013; Liu et al., 2014; Innes et al., 1995, Mainar et al., 1996; Verhelst et al., 2015). In this study, the toxoplasmosis detected in the ewes with lambs died and those with healthy lambs compatible with the above studies.

Numerous studies have been carried out to screen for the prevalence of *T. gondii* in sheep in our country. The studies and the determined rates are given in Table 3.

Table 3. The prevalence of *T. gondii* infection in sheep in different provinces of Turkey.

| Cities | Test | Seropositivity % | Reference No |
|---------------|---------------|--------------------------------------|------------------------------|
| Konya | IFAT | 13.78(aborted) 10.16(not aborted) | Sevinç et al., 2000 |
| Elazığ | SFDT | 46.8 | Aktaş et al., 2000 |
| Kars | SFDT | 51.4 | Aslantaş and Babür, 2000 |
| Amasya | SFDT | 66.6 | Karatepe et al., 2001 |
| Afyon | SFDT | 54.65 | Çiçek et al., 2004 |
| Yalova | SFDT LAT | 66.66 65.08 | Öncel et al., 2005 |
| Şanlıurfa | SFDT | 55.66 | Sevgili et al., 2005 |
| Kars | SFDT ELISA | 90.9 95.7 | Mor and Aslan, 2007 |
| Samsun | SFDT | 49 | Acıci et al., 2008 |
| Konya | IFAT | 13 | Aköz et al., 2009 |
| Nevşehir | ELISA | 10 | Özmutlu and Karatepe, 2017 |
| Niğde | ELISA | 6.28 | Güler, 2011 |
| Kırıkkale | SFDT | 88 | Yıldız et al., 2014 |
| Şırnak-Silopi | IFAT | 97 | Leblebicier and Yıldız, 2014 |
| Hatay | ELISA | 53.8 | Muz et al., 2013 |

In our study; the prevalence of toxoplasmosis positive sera (58%) was lower than that observed in Kars (Aslantaş and Babür, 2000), Amasya (Karatepe et al., 2001), Yalova provinces (Öncel et al., 2005) and the Silopi district of Şırnak province (Leblebicier and Yıldız, 2014) and higher than that in the provinces of Nevşehir (Özmutlu and Karatepe, 2017), Konya (Aköz et al., 2009), Elazığ (Aktaş et al., 2000), and similar to the rate in the provinces of Afyon (Çiçek et al., 2004), Hatay (Muz et al., 2013) and Şanlıurfa (Sevgili et al., 2005).

Buxton et al. (2007) reported that 2% of neonatal lamb mortality was due to toxoplasmosis (Buxton et al., 2007). Reif et al. (1989) determined *T. gondii* seropositivity at the rate of 27% in 211 sheep blood sera in Peru and by comparing the difference between seropositivity and seronegativity, they revealed the relationship between toxoplasmosis and lamb mortality as well as sheep infertility. In seropositive sheep, the rate of neonatal lamb mortality was determined as 30.7% and in seronegative sheep, the rate was determined as 13.6% in the USA (Huffman et al., 1985). The studies described above match up with our findings. This study is very important in terms of revealing the relationship between neonatal lamb mortality and toxoplasmosis.

The results of this study showed that toxoplasmosis can play an important role in lamb mortality. Besides, toxoplasmosis causes serious pathological disorders in humans, especially in pregnant women or immuno-deficient people. In addition, it causes significant yield losses in sheep breeding. Farmers and students of veterinary medicine should be informed on the methods of prevention from the disease by emphasizing the zoonotic nature of the disease.

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