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Seroprevalence of *Neospora caninum* in Goats from Korkuteli District of Antalya

Antalya'nın Korkuteli Yöresi Keçilerinde Neospora caninum'un Seroprevalansı

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ABSTRACT

Objective: this study aimed to determine the seroprevalence of *Neospora caninum* in goats from the Korkuteli district of Antalya.
Methods: During the study, sera samples were obtained from 184 female goats and analyzed for the presence of antibodies against *N. caninum* using a commercial ELISA kit.
Results: Seroprevalence of *N. caninum* was determined as 4.89%. Seropositivity of *N. caninum* in goats was not statistically significant (p>0.05) in terms of study centers, age groups, and abort situation.
Conclusion: This study reports the first data on the presence and seroprevalence of *N. caninum* in the goats in the region.
Keywords: *Neospora caninum*, goat, seroprevalence, ELISA

ÖZ

Amaç: Bu çalışmada, Antalya'nın Korkuteli ilçesindeki keçilerde *Neospora caninum* seroprevalansının belirlenmesi amaçlanmıştır.
Yöntemler: Çalışma süresince 184 dişi keçiden serum örnekleri elde edilmiş ve ticari bir ELISA kiti kullanılarak *N. caninum*'a karşı antikorların varlığı araştırılmıştır.
Bulgular: *N. caninum*'un seroprevalansı %4,89 olarak belirlenmiştir. Keçilerde *N. caninum* seropozitifliği, çalışma merkezleri ile yaş grupları ve abort durumuna göre istatistiksel olarak önemsiz bulunmuştur (p>0,05).
Sonuç: Bu çalışma bölgedeki keçilerde *N. caninum* varlığı ve seroprevalansına ilişkin ilk verileri ortaya çıkarmıştır.
Anahtar Kelimeler: *Neospora caninum*, keçi, seroprevalans, ELISA

INTRODUCTION

Neospora caninum is an obligate intracellular coccidian parasite and the causative agent of neosporosis, with a wide host range and a heteroxenous life cycle (1,2). Dogs are both the intermediate and definitive host for *N. caninum* (3). This parasite was first discovered in a dog with encephalomyelitis and myositis in 1984 in Norway (4). Until 1988, *N. caninum* was known as *Toxoplasma gondii* due to structural similarities, and since then, it has been described as a new genus and species (2,3,5). The life cycle of *N. caninum* is characterized by 3 infective stages: Tachyzoites, tissue cysts, and oocysts (6).

Neosporosis has emerged as a serious disease in dogs and cattle widespread worldwide. At the same time, the presence of clinical neosporosis has been observed in goats and sheep (3). While neosporosis causes muscle diseases, paralysis, and death in dogs, it causes abortions and deaths in sheep, cattle, and goats (3,7,8). Goats are economically important animals in rural areas in many countries. There has been an epidemiological knowledge gap about the seroprevalence of *N. caninum* in goats in Turkey. Several research on *N. caninum* infections in Turkey was largely conducted in dogs and cattle. Limited surveys on goats reported various seroprevalence rates in different regions of Turkey (9-14). For contributing to the epidemiological data of *N. caninum* in goats in Turkey, we aimed to evaluate the seroprevalence of *N. caninum* from goats in different regions Korkuteli district, Antalya.

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Türkiye PARAZİTOLOJİ Dergisi

METHODS

Study Area

A total of 6 different centers (Dereköy, Çaykenarı, İmecik, Yazır, Leylek ve Akyar) located in Korkuteli district of Antalya (37°-3' N and 30°-11' E) were included in the survey. This district is known to have an annual average temperature of 13 °C and an annual average rainfall of 466 mm. The average air temperature in the district is generally recorded as -5 °C in winters and 25 °C in summers.

Animals and Blood Collection

A total of 184 female goats with 1-7 years of age were randomly selected between February to July 2014. 10 mL whole blood sample from vena jugularis of goats was taken into sterile vacuum tubes, and abortion status of goats was recorded. Serum samples were obtained from the blood in the laboratory and stored at -20 °C until analysis.

Serological Analysis

Antibodies against *N. caninum* in collected sera were screened using a commercial c-ELISA kit (IDEXX, Switzerland AG Stationsstrasse 12 3097 Liebefeld-Bern, Switzerland), according to the manufacturer's instructions. The OD values in the wells of microplates were measured at 450 nm wavelength using an ELISA reader (microtiter plate reader, MR-96A), and the calculations were done using the formula included in the IDEXX kit procedure.

Statistical Analysis

A chi-square test was performed by SPSS (Statistical Program for Social Science) for Windows 15.0 Statistical Package Program, to statistically evaluate seropositivity of goats according to age groups, study centers, and abortion status.

RESULTS

Specific antibodies to *N. caninum* were detected in a total of 9 (4.89%) of 184 goats, and seropositivities of different centers were given in Table 1. The highest prevalence value was determined in goats sampled from İmecik with 11.53% prevalence, whereas there was no seropositivity in goats in Çaykenarı, Yazır, and Leylek regions (Table 1). The seropositivity of *N. caninum* was not statistically significant in terms of study centers ($p>0.05$).

The seropositivity among different age groups is shown in Table 2. The highest seroprevalence was in the five years of age group. However, the difference among age groups was not statistically significant ($p>0.05$).

The seropositivity of goats with and without abortion is given in Table 3. Correspondingly, 3 (8.10%) out of 37 goats and 6 (4.08%) out of 147 goats were seropositive in the abort and without abort groups, respectively. The difference in the seroprevalence of *N. caninum* between the goats with abortion and without abortion groups was not statistically significant ($p>0.05$).

DISCUSSION

Serological techniques such as ELISA, NAT, IFAT, and DAT, and molecular methods are commonly used to diagnose neosporosis due to non-specific and insufficient clinical symptoms of the disease. ELISA and IFAT are frequently used methods in the serological diagnosis of neosporosis (2,15). There have been a couple of studies on the presence and prevalence of *N. caninum* in goats in the world. The seroprevalence of 3.3% to 15.0% in Brazil (7,16,17), 5.7% in Southern Jordan (18), 9% in Poland (19), 6% in the Czech Republic (8), 2.3% in Romania (20), 6.9% in Greece (21), 12.0% in Argentina (22), and 5.6% in Iraq (23) were reported by several researchers. Furthermore, Andrade Gda et al. (24), indicated a herd level seroprevalence of *N. caninum* as 75.2% in Brazil. The studies on the seroprevalence of neosporosis in goats in Turkey are limited. Sevgili et al. (9) reported 4.7% and 5.2% seroprevalence in Bristle and Aleppo goats in Şanlıurfa. Cayvaz and Karatepe (10) indicated 25.9% seroprevalence in goats in Niğde region. Seroprevalences of 10.2% in goats, 13.8% in Bristle goats, and 2.4% in Saanen goats were reported from Elazığ, Kırşehir, and Erzurum provinces, respectively (12). Utuk and Eski (13) indicated seroprevalence of 6.52 % and 23.91% in Shami and Kilis goats in Kilis. They also reported individual and flock base seroprevalence of *N. caninum* as 8.9% and 66.6% in goats in Adana (14). Özdamar et al. (11) determined seroprevalence of 8.69% in goats in Ordu. In the current study, we determined a mean *N. caninum* seroprevalence of 4.89% in goats in Korkuteli region of Antalya, which places in the range of the rates reported from different regions of Turkey. The seroprevalence detected in our study also shows similarities to the rates reported from Brazil (7), Romania (20), South Jordan (18), Czech Republic (8), Greece (21), and Iraq (23). The variation in the seroprevalence of *N. caninum* in different regions could be influenced by several factors such as breeds, breeding and feeding conditions, sample size, climatic and environmental conditions, and diagnostic methods.

In the evaluation of neosporosis over the age groups of goats, we determined that the seroprevalence of *N. caninum* was not affected by age. Similar findings were reported by Sevgili et al. (9), Utuk and Eski (14), and Özdamar et al. (11). However, age dependent seroprevalence of *N. caninum* in goats was also indicated by Cayvaz and Karatepe (10), Utuk et al. (12), and Ghattof and

Table 1. Seropositivity of *N. caninum* according to the study centers

Study centers	Months	No of examined goat	No of seropositive	Seroprevalence (%)	χ^2	p
Dereköy	February	30	2	6.66		
Çaykenarı	March	30	0	0.00		
İmecik	April	26	3	11.53		
Yazır	May	30	0	0.00	9.233	0.100
Leylek	June	27	0	0.00		
Akyar	July	41	4	9.75		
Total		184	9	4.89		

Table 2. Seropositivity of *N. caninum* according to the age groups					
Age groups	**No of examined**	**No of seropositive**	**Positive (%)**	χ^2	**p**
1-2	19	0	0.00	1.444	0.837
3	41	2	4.87		
4	46	2	4.34		
5	28	2	7.14		
6-7	50	3	6.00		

Table 3. Seropositivity in aborting and non-aborting goats					
	No of animal	**No of seropositive animal**	**Positive (%)**	χ^2	**p**
Aborting	37	3	8.10	1.030	0.388
Non-aborting	147	6	4.08		

Faraj (23) who reported higher infection rates in older age groups. Higher prevalence in older animals could attribute to the horizontal transmission by ingestion of *N. caninum* sporulated oocysts (7). There was no statistically significant difference between the seropositivity in the aborted and non-aborted goats in the present study. This finding is consistent with the published reports regarding the seroprevalence of *N. caninum* associated with the abortion status of goats (10,11,14,23). Although our study and the above mentioned investigations did not indicate a direct association between the parasite and abortion in goats, *N. caninum* should not be ignored among the possible causes of abortion cases (5).

CONCLUSION

Our results indicate that goats in the Korkuteli region of Antalya were infected with *N. caninum* with a mean seroprevalence of 4.8%. In spite of the veterinary and economic importance of this protozoan parasite, there are few published reports, in the world, concerning the main effect of *N. caninum* to goat health. Further comprehensive studies using molecular and serological diagnostic tools with large scale samplings are needed to explore the true effect and risk factors associated with *N. caninum* in goats.

* Ethics

Ethics Committee Approval: This study was approved by the Erciyes University Local Ethics Committee for Animal Experiments (date: 09.10.2013, no: 12/122).

Informed Consent: Patient consent is not required for this study.

Peer-review: Internally and externally peer-reviewed.

* Authorship Contributions

Concept: M.A., M.K., A.Y., Design: M.A., M.K., A.Y., Data Collection or Processing: M.A., M.K., A.Y., Analysis or Interpretation: M.A., M.K., A.Y., Literature Search: M.A., M.K., A.Y., Writing: M.A., M.K., A.Y.

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