

Detection of *Neospora caninum* IgG Antibodies in Goats in Elazig, Erzurum and Kirsehir Provinces of Turkey

Utuk, A.E.,*¹ Simsek, S.,² Piskin, F.C.,¹ and Balkaya, I.³

¹ Central Veterinary Control and Research Institute, Parasitology and Bee Diseases Laboratory, Ankara, Turkey.

² University of Firat, Faculty of Veterinary Medicine, Department of Parasitology, Elazig, Turkey.

³ University of Ataturk, Faculty of Veterinary Medicine, Department of Parasitology, Erzurum, Turkey.

* **Corresponding Author:** Dr. Armağan Erdem UTUK, Central Veterinary Control and Research Institute Parasitology and Bee Diseases Laboratory, 06020, Ankara, Turkey. Phone: + 90 312 326 00 90/ 141; Fax: + 90 312 321 17 55; e-mail: erdemutuk@hotmail.com

ABSTRACT

The aim of this study was to detect *Neospora caninum* IgG antibodies in Saanen and Hair goats from Elazig, Erzurum and Kirsehir provinces of Turkey. For this, a total of 128 sera obtained from goats were tested using a commercially available competitive enzyme-linked immunosorbent assay (c-ELISA) kit. Overall prevalence of anti-*N.caninum* antibodies was 10.2% (13/128); and mean prevalence in Hair and Saanen goats were 13.8% (12/87) and 2.4% (1/41) respectively. This is the first serological study on caprine neosporosis in the above mentioned provinces of Turkey.

Keywords: *Neospora caninum*, goat, c-ELISA, Turkey.

INTRODUCTION

Neospora caninum is a coccidian parasite. It was first identified in dogs with encephalomyelitis and myositis in 1984, and was described as a new genus and species in 1988. Dogs are both definitive and intermediate hosts. Cattle, sheep, goats, horses and deer are intermediate hosts. Dogs can acquire infection by ingestion of infected tissues; and intermediate hosts can be infected either by horizontal postnatal infection or by vertical transmission during pregnancy (1-3).

In *Neospora* infection, cows can abort; fetuses may die *in utero*, be resorbed, mummified, autolyzed, stillborn, born alive with clinical signs or born normally, but persistently infected. Moreover, infection may cause premature culling, diminished milk production and repeat breeder problems in herds (1-7). Although neosporosis is a major problem in cattle, serological, molecular and experimental data show that *N.caninum* can cause clinical infections in goats. Abortions, fetal deaths and stillbirths have been reported in goats due to *N.caninum* (8-13). *N.caninum* antibodies were reported in

goats in Southern and Northern Jordan, Poland, Brazil, Sri Lanka, Taiwan and Turkey (14-21).

The aim of this study was to detect *N.caninum* IgG antibodies in Saanen and Hair goats from Elazig, Erzurum and Kirsehir provinces of Turkey.

MATERIALS AND METHODS

Sample collection

Blood samples were collected from the jugular vein in sterile tubes from 128 dairy goats originating from Saanen and Hair breeds in Erzurum, Elazig and Kirsehir provinces of Turkey (Figure 1). Age of the animals ranged from 2 to 4 years. Sera were removed after centrifugation at 2000 rpm for 5 minutes and stored at -20 °C until tested.

Serologic examination

Antibodies to *N.caninum* were detected using a commercially available competitive enzyme-linked immunosorbent assay (c-ELISA) kit (VMRD, USA). The test was carried

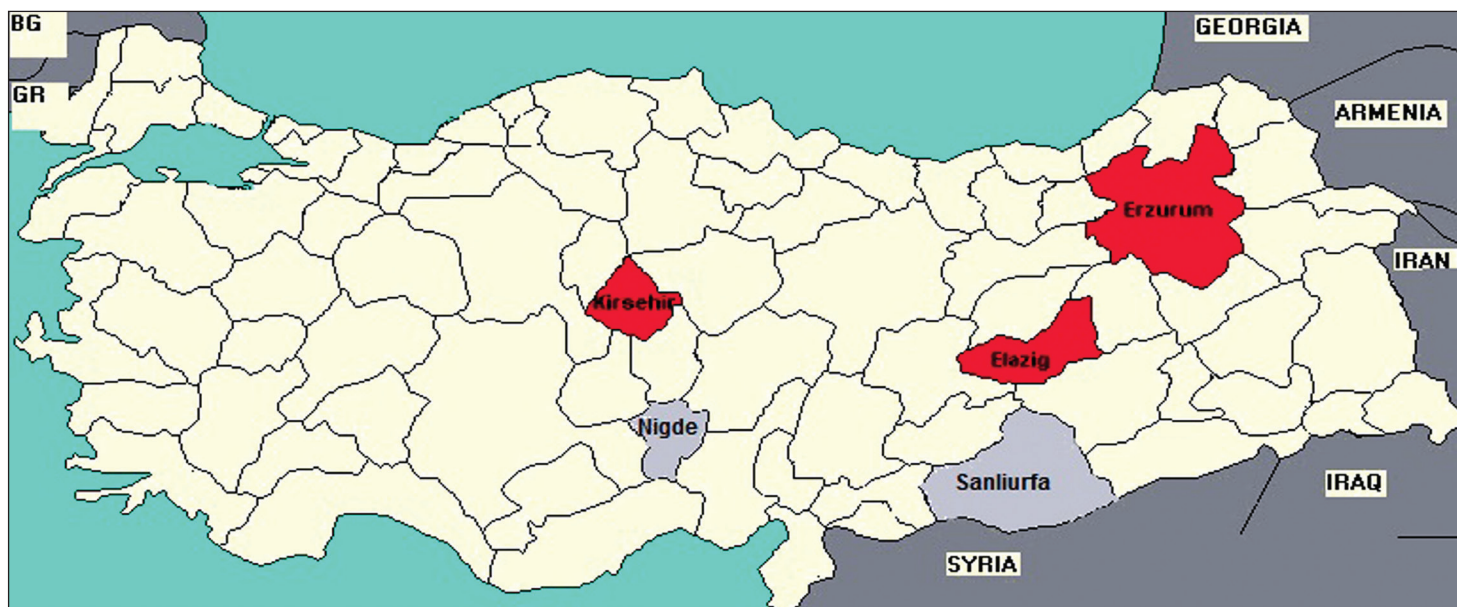


Figure 1: Location of study areas in Turkey. Areas shaded in red are covered in this study. Grey-shaded areas have been explored in previous studies.

out by following the instructions of the manufacturer. The mean optical density (OD) at 630 nm was determined for all wells using a microplate reader (ELx 800 UV, Universal Microplate Reader, Bio-Tec Instruments, Inc., VT, USA). The percent inhibition for each test sample was determined using the formula:

$$\text{Inhibition (\%)} = 100 - \left[\frac{\text{Sample O.D.} \times 100}{\text{Mean Negative Control O.D.}} \right]$$

The samples with values of $\geq 30\%$ inhibition were regarded as positive and those with the values $< 30\%$ inhibition were regarded as negative.

Data analysis

Data management and statistical analysis by Fisher’s exact chi square tests were performed using SPSS 10.1 software for Windows. The level of significance was considered to be 5% ($P < 0.05$).

RESULTS

The overall seroprevalence of *N.caninum* was 10.2% (13/128). Mean seroprevalences of Hair and Saanen breeds were 13.8% (12/87) and 2.4% (1/41) respectively. No statistical difference were found between

Saanen and Hair breeds ($P > 0.05$). Results of the study are summarized in table (Table 1).

DISCUSSION

Neosporosis is a major problem for cattle breeders, and causes economic loses in the dairy industry throughout the world (1-3). Therefore, existing studies are concentrated on bovine neosporosis; and there is limited serological data about caprine neosporosis (1-3). Abo-Shehada and Abu-Halaweh studied 302 goats from 62 flocks in northern Jordan, and found the prevalence to be 12% at flock level and 2% at the individual level, respectively (14), Al-Majali *et al.* reported individual level and flock level seroprevalence as 5.7% and 48.7% in 300 goats from 24 flocks in southern Jordan (15), Czopowicz *et al.* tested 1060 sera for antibodies against

Table 1: Seroprevalence of *N.caninum* in different provinces of Turkey.

Location	Examined (n)			Infected (%)					
	Saanen	Hair	Total	Saanen		Hair		Total	
				n	%	n	%	n	%
Elazig	-	70	70	-	-	8	11.4	8	11.4
Erzurum	-	17	17	-	-	4	13.8	4	23.5
Kirsehir	41	-	41	1	2.4	-	-	1	2.43
Total	41	87	128	1	2.4	12	23.5	13	10.2

N.caninum and determined the true herd level prevalence as 9.0% in Poland (16). Uzêda *et al.* found the prevalence as 15% in 385 goats in Bahia, Brazil (18), Faria *et al.* found the prevalence as 3.3% in 306 goats in the north-east region of Brazil (17), other researchers reported the seroprevalance rates as 7.0% (3/486) in Sri Lanka (19) and 0% (0/24) in Taiwan (22). Different diagnostic tests such as ELISA, indirect fluorescence antibody test (IFAT) and enzyme immunoassay (EIA) were used in the reported studies (14-19, 22).

Seroprevalences of *N.caninum* were determined to be 25.9% (47/181) in Nigde, and 5% (9/180) in the Sanliurfa provinces of Turkey (Figure 1) (20, 21). In this study, we identified the overall prevalence as 10.2% (13/128) in three different provinces of Turkey. Mean seroprevalences were 23.5%, 11.4%, and 2.4% in Erzurum, Elazig and Kirsehir provinces, respectively. Seroprevalence rates decreased from east to west. In addition, mean seroprevalence of Hair and Saanen goats were 13.8 % and 2.4 %. Although the test (c-ELISA) used and the sex of animals tested was the same, seroprevalence rates were different in three separate studies conducted in five different provinces of Turkey (20, 21). In these studies, there is no data about the breeding and feeding systems of goats. In their study, Cayvaz and Karatepe did not mention the breed of goats, and ages of the animals ranged from 1 to 5 years (20). Sevgili *et al.* studied Aleppo and Hair goats between the ages of 1-6 years (21). In the present study, we detected *N.caninum* antibodies in Saanen and Hair goats between the ages of 2-4 years. Study areas of three research projects were Central Anatolia (Nigde and Kirsehir), East Anatolia (Elazig and Erzurum) and Southeastern Anatolia (Urfa) which have steppe, continental and semi-arid continental climate, respectively. Southern Anatolia is the driest and East Anatolia is the coldest regions of Turkey (23). Likewise, seroprevalence rates are different in two different parts of Jordan and Brazil (14, 15, 17, 18). Therefore, these differences can be explained by the use of different breeds, sample sizes, climatic factors and breeding and feeding systems.

At present, there is no effective treatment for neosporosis (1). For prevention against caprine neosporosis, routine serological surveys can be done in goat flocks; and in case of low seroprevalence rates, positive dams can be culled. Reduction in the population of stray dogs and limiting their access to goat food, water sources, or to placental membranes and carcasses of aborted goat fetuses may control postnatal infection

and decrease the risk of contamination of the environment and later infection with oocysts shed in the feces of dogs.

In the present study we determined the rate of exposure of caprine neosporosis in Erzurum, Elazig and Kirsehir provinces of Turkey. We consider that further serological and clinical studies on caprine neosporosis are necessary for developing effective control programs. A clear understanding of the epidemiology of the disease both in Turkey and globally is required.

REFERENCES

1. Anderson, M.L., Andrianarivo, A.G. and Conrad, P.A.: Neosporosis in Cattle. *Anim. Rep. Sci.* 60-61: 417-431, 2000.
2. Dubey, J.P.: Review of *Neospora caninum* and neosporosis in animals. *Korean. J. Parasitol.* 41: 1-16, 2003.
3. Dubey, J.P. and Schares, G.: Diagnosis of bovine neosporosis. *Vet. Parasitol.* 140: 1-34, 2006.
4. Simsek, S., Utuk, A.E., Koroglu, E., Dumanlı, N. and Risvanli, A.: Serprevalance of *Neospora caninum* in repeat breeder dairy cows in Turkey. *Arch. Tierz. Dummerstorf.* 51: 143-148, 2008.
5. Pişkin, F.C. and Utuk, A.E.: Seroprevalence of *Neospora caninum* in cows with stillbirth and abortion. *J. Etlik. Vet. Microbiol.* 20: 23-26, 2009.
6. Thurmond, M.C. and Hietala, S.K.: Culling associated with *Neospora caninum* infection in dairy cows. *Am. J. Vet. Res.* 57: 1559-1562, 1996.
7. Thurmond, M.C. and Hietala, S.K.: Effect of congenitally acquired *Neospora caninum* infection on risk of abortion and subsequent abortions in dairy cattle. *Am. J. Vet. Res.* 58: 1381-1385, 1997.
8. Barr, B.C., Anderson, M.L., Woods, L.W., Dubey, J.P. and Conrad, P.A.: Neospora-like protozoal infections associated with abortion in goats. *J. Vet. Diagn. Invest.* 4: 365-367, 1992.
9. Dubey, J.P., Morales, J.A., Villalobos, P., Lindsay, D.S., Blagburn, B.L. and Topper, M.J.: Neosporosis-associated abortion in a dairy goat. *J. Am. Vet. Med. Assoc.* 208, 263-265, 1996.
10. Lindsay, D.S., Rippey, N.S., Powe, T.A., Sartin, E.A., Dubey, J.P. and Blagburn, B.L.: Abortions, fetal death, and stillbirths in pregnant pygmy goats inoculated with tachyzoites of *Neospora caninum*. *Am. J. Vet. Res.* 56: 1176-1180, 1995.
11. Dubey, J.P., Acland, H.M. and Hamir, A.N.: *Neospora caninum* (Apicomplexa) in a stillborn goat. *J. Parasitol.* 78: 532-534, 1992.
12. Corbellini, L.G., Colodel, E.M. and Driemeier, D.: Granulomatous encephalitis in a neurologically impaired goat kid associated with degeneration of *Neospora caninum* tissue cysts. *J. Vet. Diagn. Invest.* 13: 416-419, 2001.
13. Eleni, C., Crotti, S., Manuali, E., Costarelli, S., Filippini, G., Moscati, L. and Magnino, S.: Detection of *Neospora caninum* in an aborted goat foetus. *Vet. Parasitol.* 123: 271-274, 2004.
14. Abo-Shehada, M.N. and Abu-Halaweh, M.M.: Flock-level seroprevalence of, and risk factors for, *Neospora caninum* among sheep and goats in northern Jordan. *Prev. Vet. Med.* 93: 25-32, 2010.

15. Al-Majali, A.M., Jawasreh, K.I., Talafha, H.A. and Talafha, A.Q.: Neosporosis in Sheep and Different Breeds of Goats from Southern Jordan: Prevalence and Risk Factors Analysis. *Am. J. Anim. Vet. Sci.* 3: 47-52, 2008.
16. Czopowicz, M., Kaba, J., Szaluś-Jordanov, O., Nowicki, M., Witkowski, L. and Frymus, T.: Seroprevalence of *Toxoplasma gondii* and *Neospora caninum* infections in goats in Poland, *Vet. Parasitol.* 178: 339-341, 2011.
17. Faria, E. B., Gennari, S.M., Pena, H.F.J., Athayde, A.C.R., Silva, M.L.C.R. and Azevedo, S.S.: Prevalence of anti-*Toxoplasma gondii* and anti-*Neospora caninum* antibodies in goats slaughtered in the public slaughterhouse of Patos city, Paraíba State, Northeast region of Brazil. *Vet. Parasitol.* 149: 126-129, 2007.
18. Uzeda, R.S., Pinheiro, A.M., Fernandez, S.Y., Ayres, M.C.C., Gondim, L.F.P. and Almeida, M.A.O.: Seroprevalence of *Neospora caninum* in dairy goats from Bahia, Brazil. *Small Rumin. Res.* 70: 257-259, 2007.
19. Naguleswaran, A., Hemphill, A., Rajapakse, R.P. and Sager, H.: Elaboration of a crude antigen ELISA for serodiagnosis of caprine neosporosis: validation of the test by detection of *Neospora caninum*-specific antibodies in goats from Sri Lanka. *Vet. Parasitol.* 126: 257-262, 2004.
20. Sevgili, M., Çımtay, İ. and Keskin, O.: Şanlıurfa yöresindeki keçilerde *Neospora caninum* enfeksiyonunun seroprevalansı. *Türkiye Parazitol. Derg.* 27: 249-251, 2003.
21. Cayvaz, M. and Karatepe, M.: Niğde yöresi keçilerinde *Neospora caninum*'un seroprevalansı. *Kafkas. Univ. Vet. Fak. Derg.* (In press), 2011.
22. Ooi, H.K., Huang, C.C., Yang, C.H. and Lee, S.H.: Serological survey and first finding of *Neospora caninum* in Taiwan, and the detection of its antibodies in various body fluids in cattle. *Vet. Parasitol.* 90, 47-55, 2000.
23. Anonymous: Turkey. <http://en.wikipedia.org/wiki/Turkey>, accessed on 27 September 2011.