Available online at www.sciencedirect.com
ScienceDirect
Veterinary Parasitology 149 (2007) 126–129
veterinary parasitology
www.elsevier.com/locate/vetpar

Short communication

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

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Received 9 April 2007; received in revised form 24 May 2007; accepted 5 July 2007

Abstract

The prevalence of anti-*Toxoplasma gondii* and anti-*Neospora caninum* antibodies was investigated in goats slaughtered in the public slaughterhouse of Patos, State of Paraíba, Northeast region of Brazil, and possible associations between sex of the animals and antibody prevalence were verified. Three-hundred six blood samples from goats collected before slaughter by jugular venopuncture were used. For the serologic diagnosis of *T. gondii* and *N. caninum*, the indirect fluorescent-antibody test (IFAT) with cut-off values 64 and 50, respectively, was carried out. The prevalence of anti-*T. gondii* antibodies was 24.5% [95% CI = 19.8–29.7%] with titers ranging from 64 to 4096, and anti-*N. caninum* antibodies was 3.3% (95% CI = 1.6–5.9%) with titers ranging from 50 to 400. There were no associations between sex of animals and prevalence of anti-*T. gondii* and anti-*N. caninum* antibodies.

Keywords: Goats; *Toxoplasma gondii*; *Neospora caninum*; Seroprevalence; Patos city

1. Introduction

Toxoplasma gondii and *Neospora caninum* are two closely related protozoan parasites that are distributed worldwide. Both organisms can infect a wide range of animal species and have an indirect life cycle with carnivores as the definitive hosts.

In goats, *T. gondii* can cause abortion or neonatal mortalities (Dubey and Beattie, 1988). The organism is estimated to infect 4–77% of the human population (Tenter et al., 2000). Although not normally a significant problem for healthy individuals, *T. gondii* infection can be life threatening for infants infected congenitally and pharmacologically immunosuppressed patients (Chintana et al., 1998). However, its greatest impact is in late AIDS patients, where up to 25% of patients will develop toxoplasmic encephalitis (Lucas et al., 1993). In animals, *T. gondii* infection not only results in significant reproductive and hence economic losses, but also has implications for public

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0304-4017/$ – see front matter
doi:10.1016/j.vetpar.2007.07.009

health since consumption of infected meat or milk can facilitate zoonotic transmission.

As *T. gondii*, *N. caninum* can also cause abortion or neonatal mortality in goats (Dubey, 2003). Several cases of *N. caninum* infection have been described in goats (Barr et al., 1992; Dubey et al., 1992, 1996; Corbellini et al., 2001; Eleni et al., 2004; Figliuolo et al., 2004; Uzêda et al., 2004). However, the rates of *N. caninum* infection and the significance of the disease in this species have been poorly investigated.

Goats are economically important in many countries, including Brazil, where this species is an important source of meat and milk for humans, particularly in Northeast region, in which 93.7% of the goats are concentrated (Brazil, 2007).

In view of the importance of *T. gondii* in worldwide goat breeding and public health and the lack of data on seroprevalence of *T. gondii* and *N. caninum* infections in Paraíba State, this work aimed to estimate the prevalence of anti-*T. gondii* and anti-*N. caninum* antibodies in goats slaughtered in the public slaughterhouse of Patos city, Paraíba State, Northeast region of Brazil by specific antibody search using indirect fluorescent-antibody test (IFAT). It was also designed to assess possible associations between sex of the animals and the prevalence for each of these protozoa.

2. Materials and methods

Goats slaughtered in the public slaughterhouse of Patos city, Paraíba State, Northeast region of Brazil were analyzed. The number of samples was calculated taking into account the assumed prevalence for *T. gondii* and *N. caninum* of near 50%, to maximize the sample size and obtain a minimal confidence of 95%, and a statistical error of 6% (Thrusfield, 1995). Calculations were executed using EpiInfo version 6.04, resulting in a sample of 267 goats. A total of 306 blood samples were collected by jugular venopuncture before slaughter during August to October 2006. Sera were kept at −20 °C until use.

For the detection of anti-*T. gondii* antibodies the IFAT was performed considering 1:64 dilution as the cut-off point (Garcia et al., 1999) and according to the method of Camargo (1974) using RH strain tachyzoits as the antigen. IFAT for *N. caninum* was performed according to Paré et al. (1995), adopting 1:50 dilution as the cut-off point (Lindsay et al., 1995). NC-1 strain of *N. caninum* cultured in bovine monocytes was used as the antigen. The conjugate used in both tests was anti-goat IgG (whole molecule, SIGMA, St. Louis, MO, USA). Positive and negative controls were used. Positive sera were tested until the maximum dilution titer was reached.

The prevalence of anti-*T. gondii* and anti-*N. caninum* antibodies was estimated from the ratio of positive results to the total number of goats examined, with the exact binomial confidence interval of 95% (Thrusfield, 1995), using the program EpiInfo, version 6.04. Possible associations between sex of the animals and *T. gondii* and *N. caninum* antibody seroprevalence were verified by Chi-square test (χ^2) when possible or by Fischer exact test (Zar, 1999), with a significance level of 5%.

3. Results

For *T. gondii*, from 306 tested samples, 75 were positive (IFAT $\geq$ 1:64), resulting in a seroprevalence of 24.5% (95% CI = 19.8–29.7%) (Table 1). In male goats, the seroprevalence was 30.8% (95% CI = 22.7–39.9%) and in female was 20.4% (95% CI = 14.9–26.9%). There was no association between sex and prevalence of anti-*T. gondii* antibodies ($P = 0.055$). Overall, 19 (6.2%), 7 (2.3%), 12 (3.9%), 18 (5.9%), 8 (2.6%), 8 (2.6%) and 3 (1.0%) goats were seropositive at titers of 64, 128, 256, 512, 1024, 2048 and 4096, respectively (Table 2).

For *N. caninum*, from 306 tested samples, 10 were positive (IFAT $\geq$ 1:50), resulting in a seroprevalence of 3.3% (95% CI = 1.6–5.9%) (Table 1). In male goats, the seroprevalence was 5.0% (95% CI = 1.9–10.6%) and in female was 2.2% (95% CI = 0.6–5.4%). There was also

Table 1
Prevalence of anti-*Toxoplasma gondii* and anti-*Neospora caninum* antibodies by IFAT in 306 goats slaughtered in the public slaughterhouse of Patos city, Paraíba State, Northeast region of Brazil, by sex

Sex	No. of animals	Prevalence of anti-*T. gondii* antibodies			Prevalence of anti-*N. caninum* antibodies		
		No.	%	95% CI (%)	No.	%	95% CI (%)
Male	120	37	30.8	22.7–39.9	6	5.0	1.9–10.6
Female	186	38	20.4	14.9–26.9	4	2.2	0.6–5.4
Total	306	75	24.5	19.8–29.7	10	3.3	1.6–5.9