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Prevalence of *Toxoplasma gondii* in cats from Colombia, South America and genetic characterization of *T. gondii* isolates

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Abstract

Cats are important in the epidemiology of *Toxoplasma gondii* infection because they are the only hosts that can excrete the environmentally-resistant oocysts. In the present study, prevalence of *T. gondii* was determined in serum, feces, and tissues of 170 unwanted cats from Colombia, South America. Antibodies to *T. gondii* were assayed by the modified agglutination test and found in 77 of 170 (45.2%) cats with titers of <1:5 in 93, 1:5 in eight, 1:10 in 17, 1:20 in 10, 1:40 in seven, 1:80 in four, 1:160 in eight, 1:320 in six, and 1:640 or higher in 17 cats. *T. gondii* oocysts were not found in feces of any cat as ascertained by bioassay in mice. Tissues (brain, heart, tongue) of 116 cats were bioassayed in mice or cats. *T. gondii* was isolated from tissues of 15 of the 42 cats with titers of 1:40 or higher and not from any of the 90 cats titers of 1:20 or lower. Of the 29 cats whose tissues were bioassayed individually, *T. gondii* was isolated from the tongues of nine, hearts of eight, and brains of five. Mice inoculated with tissues of 12 of 15 infected cats died of toxoplasmosis; with nine *T. gondii* isolates all infected mice died. Overall, 65 of 92 (70%) of *T. gondii*-infected mice died of toxoplasmosis. Genotyping of these 15 isolates using polymorphisms at the SAG1, SAG2, SAG3, BTUB, and GRA6 loci revealed that three isolates (TgCtCo1, 2, and 7) had Type I alleles and one isolate (TgCtCo8) had Type II allele at all five loci. Eleven isolates contained the combination of Type I and III alleles and were divided into three genotypes, with TgCtCo3,5,6,9,12,13 and 15 had alleles I, I, III, I and III, TgCtCo4,10,11 had alleles I, III, III, I and I, and TgCtCo14 had alleles I, III, III, III, and III, at loci SAG1, SAG2, SAG3, BTUB and GRA6, respectively. All infected mice from

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each group had identical genotype except one mouse infected with TgCtCo5 had a Type III allele at locus BTUB and a unique allele (u-1) at locus SAG1 indicating mixed infection for TgCtCo5, whereas the rest seven mice had a Type I alleles at both loci. Published by Elsevier B.V.

Keywords: *Toxoplasma gondii*; Cats; Colombia; South America; Feces; Antibodies; Genotype

1. Introduction

Toxoplasma gondii infections are widely prevalent in human beings and other animals worldwide (Dubey and Beattie, 1988). Cats are important in the natural life cycle of *T. gondii* because they are the only hosts that can directly spread *T. gondii* in the environment. It is important to biologically and genetically characterize isolates of *T. gondii* from cats and this has been achieved only from cats from Brazil (Dubey et al., 2004; Pena et al., 2006). The objectives of the present study were to determine prevalence of *T. gondii* in cats from Colombia, South America and characterize isolates of *T. gondii* from these cats.

2. Materials and methods

In total, 170 (56 males, 85 females, for 29 sex not recorded) cats were obtained from Colombia, South America (Table 1). These cats were unwanted or stray and were euthanized by intravenous injection of Euthanex® (Invet S.A., Bogotá, Colombia) by Centro Distrital de Zoonosis as per the directorate from Secretariá de Salud de Bogotá and Armenia when efforts to place them in good homes failed. The cats were received in six batches (A–F) from May to November, 2005. From each cat, serum, brain, and heart, and feces were obtained for *T. gondii* examination. In addition, tongues were obtained from cats in batches C–F. Samples were transported refrigerated by air from Colombia to the Animal Parasitic Diseases Laboratory, United States Department of Agriculture (USDA) Beltsville, MD, where all *T. gondii* evaluations were performed using protocols approved by the USDA. Three to five days elapsed between euthanasia and examination for *T. gondii* and during this time samples were kept cold.

Sera from cats were diluted two-fold starting at 1:5 or 1:10 dilution and assayed for *T. gondii* antibodies with the modified agglutination test (MAT) as described (Dubey and Desmonts, 1987).

Feces (2–10 g) collected from the rectum of 143 cats were floated in sugar solution and a drop from the meniscus was examined microscopically between cover slip and glass slide. Fecal floats were sedimented in water, and aerated in 2% sulfuric acid on a shaker at 22 °C for 1 week and then bioassayed in mice orally (Dubey and Beattie, 1988).

Tissues of 116 from 170 cats were bioassayed for *T. gondii*; tissues from 92 cats were bioassayed in mice

Table 1
Prevalence of *T. gondii* in cats from Colombia, South America

Experiment number and batch	Date	Area	Number of cats	Number seronegative (<1:5)	Number seropositive (≥1:5)	Number bioassayed in mice	Number bioassayed in cats	*T. gondii* isolated
Tx 186 A	05.26.05	Armenia	25	3	22	25 (0[a] + 25[b])	0	4
TX 193 B	08.05.05	Armenia	8	2	6	8 (4[a] + 4[c])	0	1
TX 196 C	08.24.05	Bogota	42	25	17	17 (10[a] + 7[c])	0	7
TX 196 D	09.22.05	Bogota	16	13	3	16 (3[a] + 13[c])	0	0
TX 204 E	10.12.05	Bogota	43	26	17	14 (3[a] + 11[c])	0	2
TX 210 F	11.07.05	Bogota	36	24	12	12 (9[a] + 3[c])	24	2
Total			170	93	77	92	24	16

[a] Brain, heart, tongue of each cat were bioassayed individually.
[b] Brain and hearts of each cat were pooled.
[c] Brain, heart, tongue of each cat pooled.

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