TOXOPLASMA GONDII EXPOSURE IN FELINES: AN ALARMING FACTOR TO PUBLIC HEALTH FROM MINEIROS, GOIÁS

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ABSTRACT: Toxoplasmosis is a cosmopolitan disease caused by *Toxoplasma gondii*, an obligate protozoan that affects endothermic animals, including man. Being a zoonosis that can cause abortions, fetal malformations and blindness. Cats are the definitive hosts, acting as a source of dissemination. In order to collect epidemiological data on the distribution of *T. gondii* in Mineiros, Goiás, samples of domestic cats were analyzed to verify the circulation of the protozoan and reinforce preventive measures. Ninety-four samples of domestic cats, regardless of gender, age and breed, were randomly processed in the neighborhoods of Mineiros, Goiás. They were submitted to the indirect fluorescent antibody test for antibodies against *T. gondii*, using tachyzoites as antigens and anti-cat IgG conjugate (1:16 were positive). Of the 94 samples analyzed, 35 (37.2%) were reagents, of which four had a titration of 1:16, ten of 1:32, eleven of 1:64, eight of 1:128 and two of 1:256. All cats were semi-domiciled, but lifestyle and diet were not assessed. *T. gondii* infection is rarely symptomatic and the severity depends on the pathophysiological state. Brazil has high prevalence rates and requires effective care in the management of cats. In Mineiros, 29 reports of infected pregnant women were identified. Although infection in humans occurs primarily through consumption of undercooked meat, ingestion of oocysts in feces of cats is a possibility. Therefore, state

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public health institutions and veterinarians should promote health education, highlighting food hygiene. Since, when symptomatic, the disease presents severe clinical conditions and, in some cases, irreversible.
KEYWORDS: Cats; Imunossupression; Seropositive; Toxoplasmosis; Zoonosis.

EXPOSIÇÃO AO *TOXOPLASMA GONDII* EM FELINOS: UM FATOR ALARMANTE PARA A SAÚDE PÚBLICA DE MINEIROS, GOIÁS

RESUMO: A toxoplasmose é uma doença cosmopolita causada pelo *Toxoplasma gondii*, um protozoário obrigatório que afeta animais endotérmicos, incluindo o homem. Sendo uma zoonose que pode causar abortos, malformações fetais e cegueira. Os gatos são os hospedeiros definitivos, atuando como fonte de disseminação. Para coletar dados epidemiológicos sobre a distribuição do *T. gondii* em Mineiros, Goiás, amostras de gatos domésticos foram analisadas para verificar a circulação do protozoário e reforçar as medidas preventivas. Noventa e quatro amostras de gatos domésticos, independente de sexo, idade e raça, foram processadas aleatoriamente nos bairros de Mineiros, Goiás. Foram submetidos ao teste de anticorpo fluorescente indireto para pesquisa de anticorpos contra *T. gondii*, utilizando como antígenos taquizoítos e conjugado anti-cat IgG (1:16 foram positivos). Das 94 amostras analisadas, 35 (37,2%) eram reagentes, das quais quatro tiveram titulação de 1:16, dez de 1:32, onze de 1:64, oito de 1:128 e duas de 1:256. Todos os gatos eram semi-domiciliados, mas o estilo de vida e a dieta não foram avaliados. A infecção por *T. gondii* raramente é sintomática e a gravidade depende do estado fisiopatológico. O Brasil possui altas taxas de prevalência e requer cuidados efetivos no manejo dos gatos. Em Mineiros, foram identificadas 29 notificações de gestantes infectadas. Embora a infecção em humanos ocorra principalmente pelo consumo de carne mal cozida, a ingestão de oocistos nas fezes de gatos é uma possibilidade. Portanto, as instituições estaduais de saúde pública e os médicos veterinários devem promover a educação em saúde, destacando a higiene alimentar. Já que, quando sintomática, a doença apresenta quadros clínicos graves e, em alguns casos, irreversíveis.
Palavras-chave: Gatos; Imunossupressão; Soropositivo; Toxoplasmose; Zoonose.

EXPOSICIÓN A *TOXOPLASMA GONDII* EN FELINOS: UN FACTOR ALARMANTE PARA LA SALUD PÚBLICA DE MINEIROS, GOIÁS

RESUMEN: La toxoplasmosis es una enfermedad cosmopolita causada por *Toxoplasma gondii*, un protozoario obligado que afecta a animales endotérmicos, incluido el hombre. Ser una zoonosis que puede provocar abortos, malformaciones fetales y ceguera. Los gatos son los huéspedes definitivos, actuando como fuente de diseminación. Con el fin de recolectar datos epidemiológicos sobre la distribución de *T. gondii* en Mineiros, Goiás, se analizaron muestras de gatos domésticos para verificar la circulación del protozoario y reforzar las medidas preventivas. Noventa y cuatro muestras de gatos domésticos, independientemente de género, edad y raza, fueron procesadas al azar en los barrios de Mineiros, Goiás. Se sometieron a la prueba de anticuerpos fluorescentes indirectos contra *T. gondii*, utilizando como antígenos taquizoítos e IgG anti-cat conjugada (1:16 fueron positivos). De las 94 muestras analizadas, 35 (37,2%) fueron reactivos, de los cuales cuatro tuvieron una titulación de 1:16, diez de 1:32, once de 1:64, ocho de 1:128 y dos de 1:256. Todos los gatos tenían domicilio parcial, pero no se evaluó el estilo de vida ni la dieta. La infección por *T. gondii* rara vez es sintomática y la gravedad depende del estado fisiopatológico. Brasil tiene altas tasas de prevalencia y requiere una atención eficaz en

el manejo de los gatos. En Mineiros se identificaron 29 casos de mujeres embarazadas infectadas. Aunque la infección en los seres humanos se produce principalmente a través del consumo de carne poco cocida, la ingestión de ovoquistes en las heces de los gatos es una posibilidad. Por lo tanto, las instituciones estatales de salud pública y los veterinarios deben promover la educación sanitaria, destacando la higiene alimentaria. Dado que, cuando sintomática, la enfermedad presenta cuadros clínicos severos y, en algunos casos, irreversibles.
PALABRAS CLAVE: Gatos; Inmunosupresión; Seropositivo; Toxoplasmosis; Zoonosis.

1. INTRODUCTION

Toxoplasmosis is a cosmopolitan and zoonotic disease caused by *Toxoplasma gondii*, an obligate intracellular protozoan. Felines are the definitive hosts, as the parasite reproduces sexually in their gastrointestinal tract and reaches the environment through feces in the form of oocysts, which take from one to five days to sporulate and become infective and thus contaminate the body. ground. Most endothermic animals can harbor the agent in their tissues, in the form of tachyzoites and bradyzoites, after ingestion of oocysts in soil or plants, as well as consumption of contaminated meat (DUBEY, 2009; FEREIRA; VITOR, 2014).

The disease has a high prevalence worldwide and South and Central America have 156 different genotypes of *T. gondii*, with greater genetic variability when compared to other continents, which increases the risk of reinfection (DUBEY, 2009; FERREIRA; VITOR, 2014; SHWAB *et al.*, 2014). Exposure to *T. gondii* in domestic cats indicates the occurrence of toxoplasmosis and the risk for the animal and human population, especially in a country like Brazil, which has high prevalence rates and requires effective care in the management of these animals (ZULPO *et al.*, 2018).

The infection rarely causes clinical manifestations, and the severity depends on the age of the host, immune status, concurrent infections, pregnancy, life cycle stage and strains of the parasite. In humans with immunosuppressive conditions, the infection can lead to complications such as retinochoroiditis, miscarriages and fetal malformations, which affect public health (DUNN *et al.*, 1999).

Although felines are the definitive hosts, being the only animals able to eliminate oocysts in the feces, other factors must be considered. The climate of the Midwest region is tropical and humid, favoring the development and survival of oocysts in the environment (DUBEY, 2009). In addition, clandestine slaughter, the sale of fresh meat

without federal inspection and the production of peri-urban and urban vegetables from family farming are sources of infection when contaminated with the protozoan (PINTO-FERREIRA *et al.*, 2019).

In order to collect epidemiological data on the distribution of *T. gondii* in Mineiros, Goiás, samples of domestic cats were analyzed, showing that domestic cats are also subject to infection, especially those with access to outdoors. In addition, the research verified the circulation of the protozoan and reinforced the importance of preventive measures, as well as control measures, avoiding the development and proliferation of the parasite.

2. MATERIALS AND METHODS

2.1 Samples and Location

A total of 94 samples from domestic cats, regardless of sex, age, and breed, were processed randomly from neighborhoods of Mineiros, Goiás. The analysis was done in the Virology and Rickettsioses laboratory of the Veterinary Hospital of the Federal University of Mato Grosso.

2.2 Indirect Fluorescent Antibody Test

These samples were submitted to an indirect fluorescent antibody test (IFAT) using *T. gondii* tachyzoites as antigens and anti-cat IgG conjugate1 as recommended by Camargo (1964). The samples from 1:16 were positive.

2.3 Ethical Aspects

The study was approved by the Committee on Ethics in the Use of Animals (CEUA) of the Centro Universitário de Mineiros (UNIFIMES) under protocol number 15/2017.

3. RESULTS

Of the 94 samples analyzed by IFAT, 35 (37.2%) were reagents of whom four for a titration of 1:16, ten for 1:32, eleven for 1:64, eight for 1:128, and two for 1:256. All cats were domiciled with access to the outdoors, but their lifestyle, as well as food, were not evaluated.

4. DISCUSSION

The *T. gondii* infections have a high prevalence throughout the world (DUBEY, 2009). It is estimated that in Brazil, the seroprevalence of *T. gondii* in cats is 35.9%, with higher rates in the North-Northeast-Central West region (LUGOCH *et al.*, 2019).

The occurrence verified in this study is consistent with other researchers in the literature. In the state of Paraná, in Palotina, 29% of warded cats were reactive according to the IFAT method (SOUZA *et al.*, 2016). In accordance with the present study, a survey carried out in Cascavel was analyzed by RIFI, in which 28.07% of felines patients, from Veterinary Clinics and Hospitals, who lived under guardianship, but had access to the street and hunting behavior, were reactive animals (ANDRADE *et al.*, 2015). In Monte Negro, Rondônia, and São Luiz, Maranhão, 83.7% and 50.5% of reactive cats were found, respectively, by RIFI (BRAGA *et al.*, 2012; CAVALCANTE *et al.*, 2006).

In Goiânia, Goiás, located approximately 420 km from Mineiros, Goiás, of the 50 samples of stray cats examined by the Modified Agglutination Test (MAT), 64% were positive for anti-*T. gondii* antibodies, which is higher than described in this study, although such discrepancy could be stemmed from differences in the techniques applied, varying in sensitivity, in addition to the fact that the sampling was from non-domiciled cats, which increases the risk of infection (REZENDE *et al.*, 2019).

The exposure to *T. gondii* in domestic cats reported in this study suggests the presence of this parasite in the region, requiring effective care of managing these animals, such as raw or undercooked meat-free food, restricting outdoor access for cats, and predatory hunting. Although cats have antibody titers against *T. gondii*, there can still be the possibility of reinfection with active elimination of oocysts if there is infection by different strains (ZULPO *et al.*, 2018). South and Central America have 156 different genotypes of *T. gondii*, with higher genetic variability when compared to other continents, increasing the risk of reinfection (RORMAN *et al.*, 2006; DUBEY, 2009; FERREIRA; VITOR, 2014).

The Central-West region has a tropical and humid climate, which contributes to the development and survivability of the oocysts in the environment (DUBEY, 2009). On top of that, the municipality of Mineiros has a large production of meat made up of vast animal breeding, including poultry slaughterhouses and cattle abattoirs. By contrast, the clandestine slaughter of animals and the sale of fresh meat without federal inspection are still common in commercial establishments and fairs. Additionally, there is extensive

peri-urban and urban vegetable production from family farming. Thus, this food may be an important source of infection for the population if they are contaminated with the protozoan (PINTO-FERREIRA *et al.*, 2019).

The incidence of pregnant women infected with *T. gondii* was verified in Mineiros, where 29 notifications have already been made by the Notifiable Diseases Information System between 2016 and 2021 (BRASIL, 2021). The high rate of infection in felines, environmental contamination combined with other factors such as hygiene standards, cultural behavior and eating habits are directly related to the occurrence of human toxoplasmosis (RORMAN *et al.*, 2006). Understanding the local epidemiology and ensuring sanitary measures, such as daily cleaning of the cat's litter box, prevents the risk of human toxoplasmosis, as oocysts do not sporulate for up to one to five days (DUBEY, 2009a; PAVAN *et al*., 2016).

Furthermore, to reduce the risk of toxoplasmosis from food, they must undergo effective treatments in inactivating oocysts. Oocysts exposed to 50° C for 30 min showed to be efficient in the inactivation of meat contaminated with oocysts and treatments with pressure, and gamma irradiation can be done without the risk of compromising them. The use of sanitizers in water treatments was not effective for inactivating the oocysts, thereby heat treatments were more effective on these foods (PINTO-FERREIRA *et al.*, 2021).

5. CONCLUSION

This study identified that the occurrence of reactive cats is equivalent to other researchers of indoor animals with similar lifestyles. These findings associated with notifications of cases in humans suggest that environmental contamination is common in the region studied. Thus, public awareness of food hygiene, drinking water consumption and cooking food at safe temperatures should be highlighted. Through the practice of these preventive measures and control measures, the infectious form of *T. gondii* will be eliminated. The diet and lifestyle of the animals were not evaluated in this study, being issues that can be addressed in subsequent studies.

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